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OLD IRANIAN CALENDARS

BY

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THE OLD IRANIAN CALENDARS*

[In 1917 I made a study of the history of the Iranian system of time-reckoning, with a view to writing an article on the subject in a Persian review. This took me at that time beyond the scope of the intended article, and the idea was ultimately dropped. I had, however, made a number of notes on that subject. Two years ago I came across these notes which again roused my interest in this question. I decided to carry out the original intention and, instead of throwing away these notes on which a considerable time had been spent, to incorporate them in a monograph on this somewhat complicated question. The work is already in the printer's hands, and will, I hope, be soon at the disposal of Persian scholars. I thought, however, it might be useful to give in English, as concisely as possible, the conclusion reached in the Persian work which amounts to some 350 pages, with some of the principal arguments supporting the opinion expressed therein.]

** The Iranian calendar, like the calendars of many other nations, had many variations, each belonging to a different historical period or to a different geographical region. The influence of neighbouring cultures, the customs of kindred races, or the change of the climate due to the southward and westward movement of the Iranians in their migration from their original home, are among the factors capable of affecting changes in the whole system or in some details of it. We have records of at least six more or less different calendars in Iran, during the Islamic period, besides the well-known Muhammadan and widely used Yazdegerdian systems of time reckoning.¹ The latter, which was, at least down to the eleventh century of the Christian era, the calendar most commonly used in Iran after the Arabian calendar, and which has survived less widely used till the present century, was the same as the official calendar of the Persian empire in the

* This paper was composed in November, 1937.

** The abbreviations used in this article are: B. = Bīrūnī, ĀB. = al-Āthār al-bāqīya (Sachau's edition), M. = Marquart, Y.A. = Young-Avestan, gā. = gāhānbār, gās. = gāhānbārs.

¹ I propose to deal with these calendars later.

Sasanian period (of course, with the exception of the era). This is hardly questionable, though we have no contemporary report of that period except as to the names of the months. All our information regarding the pre-Islamic calendar is derived from works composed later than the 8th century A.D. Nevertheless, we have no reason to doubt the statements of the learned Persians of post-Sasanian times as to the calendar of their not very remote ancestors. There is also an older reference to the Persian year in a short notice by Quintus Curtius Rufus, a historian of the first century A.D. and biographer of Alexander the Great, from which it may be inferred that the Persian year in his time did not differ from the Zoroastrian year of later centuries. This author declares that "*The Magians used to sing a native song. There followed the Magians 365 young men clothed in purple (crimson) mantles equal in number to the days of the year. For with the Persians too the year is divided into the same number of days.*"¹ The Persian year as we know it in the Islamic period was, in fact, a vague year of 365 days, with twelve months each of thirty days, with the exception of the eighth month, which had thirty-five days or, rather, thirty days plus another five supplementary days, or epagomenæ, added to it. The only difference between this year and the year in use in early Sasanian times was in the place of the epagomenæ, as we shall see.

Moreover, we know that the Armenians and Cappadocians to the west of Persia, as well as the Sogdians, the Khwārazmians and the Sīstānians in the east, were all using calendars which, though the names of the months were in each case different, were, save for the place of the epagomenæ in most of them, exactly the same as the Persian.² Most

¹ Curtius, iii, 3, 10.

² The Sīstānian year even in this respect, i.e. the place of the supplementary days, had no difference from the Persian year, but in the other four calendars these days were invariably at the end of the year. The Persian epagomenæ were, as is known, moved a month forward every 120 years.

probably all these six calendars had a common origin. Now we have fortunately Armenian documents showing the dates of some Armenian months and days in the fourth, sixth and seventh centuries (mostly collected by E. Dulaurier¹). These dates correspond exactly with the positions which the corresponding Persian days of the vague year would have occupied in the Julian year at that time, according to backward calculation, the only difference being that during a part of the year there would have been a difference of five days owing to the different places of the epagomenæ.² A similar inference may be drawn from the Cappadocian dates, with their Julian correspondents, preserved in the writings of St. Epiphanius, the bishop of Constantia or Salamis (Cyprus), and relating to his own time. Here again we find that the Cappadocian dates occupy in the Julian year exactly the same places as the corresponding Persian dates would have occupied if the Persian vague year had been in use in that period (of course, again with five days difference due to the different places of epagomenæ in the year). These dates belong to the years A.D. 367 and 368, in the first of which Epiphanius became the bishop of the above-mentioned metropolis.³ There are still other indirect evidences of the use of the same Persian year in Sasanian times, some of which were discussed in my article in *BSOS.*, vol. ix, 1.⁴ Thus I think the existence in Sasanian

¹ *Recherches sur la chronologie arménienne, technique et historique*, Paris, 1859.

² It would take us too far afield to dwell upon the details of these Armenian dates here. It will suffice to say that Agathangelos, the Armenian historian of the fourth century, gives according to M. (*Das Naurōz*) the beginning of the Armenian year in 304 as corresponding to 11th September. The Persian New Year on that date was no doubt on the 6th September.

³ Though the Cappadocian year has been officially stabilized by the introduction of the Julian system of intercalation, apparently about 63 B.C., following the establishment of the Roman rule in that country in the same year, the old vague year has, nevertheless, survived a long time after that date and has continued to be the popular means of time reckoning of the common people.

⁴ "*Some chronological data relating to the Sasanian period.*"

and even earlier periods, of the same vague year as we find in later centuries in Persia, and which is up to the present day the calendar year of the followers of the Mazdayasnian religion, can be reasonably taken as an established fact. This calendar is the best known among all Iranian systems of time reckoning in ancient or middle ages, and is generally referred to as the Persian, Parsi, Mazdayasnian, Zoroastrian, or Young-Avestan calendar. We shall use this last term in the following pages to designate this particular system as distinct from other Iranian calendars of ancient times, such as Old-Avestan and Old-Persian, both of which will also be discussed here. It is the calendar of historical times and, as stated above, was in general use long before the Arabian conquest of Persia and for several centuries afterwards.¹ The later history of this calendar is more or less clear, but its earlier development and the date of its first use in Iran is controversial.

The Y.A. month name found in the Pahlavi parchment of Awrāmān (No. 3), according to the reading of Cowley, Unvālā and Nyberg, shows that the use of these names, and most probably also of the calendar to which these months belong, goes back as far as the first century B.C.² On the other hand, the existence of two other old Iranian calendars is attested by the Behistun inscription, and proved by deduction from the Avestan texts. Also the use of the Syro-Macedonian calendar in Iran in the Macedonian and Parthian periods is indisputable. The latter might have been in use in official circles and State documents³ side by side with the Young-Avestan, which may have been the people's calendar, but the two former (Old-Avestan and Old-Persian) must have

¹ Some small changes, however, have taken place from time to time during the Islamic period, and these must be described in an article dealing with the calendars of that period.

² The document in question was written twelve years before the Christian era.

³ It was certainly used on Parthian coins with Greek letters. According to Drouin (*Revue Archéologique*, Juillet-Décembre, 1889) even the Macedonian months appear on the *tetradrachms* from the time of Phraates IV (37-4 B.C.) down to A.D. 190.

preceded the Young-Avestan. Therefore the question is often asked and discussed as to when the latter was instituted. The answer is not easy to give, as the available data are very limited. For more than two centuries many scholars have tried to solve the problem, and have reached different conclusions. Freret,¹ Gibert,² Bailly,³ Drouin,⁴ West,⁵ and many others have discussed the question, and have suggested dates for its introduction, but their suggestions do not seem to be wholly satisfactory.

Gutschmid,⁶ though he has made a profound study of the general subject of the Iranian calendar, was, however, misled on this point (like Gibert before him) by his own misunderstanding of a passage in the book of the Persian astronomer Kūshyār (tenth century) as to the coincidence of the sun's entry into Aries with the Persian month Ādhur in the time of the Sasanian king, Khosrau I (Anōsharvān). Thinking that the passage in question meant that the equinox was on the first day of Ādhur, Gutschmid made this wrong interpretation the basis of his calculation, and came to the conclusion that the Y.A. calendar was introduced in 411 B.C. This view found acceptance among later students of the question for some time.⁷

Marquart, however, in the last part of his *Untersuchungen zur Geschichte von Ērān*, p. 210, went a step further in the solution of this problem. He made, indeed, a remarkable

¹ "De l'ancienne année des Perses," 1742, published in *l'Histoire de l'Académie Royale des inscriptions et belles lettres*, tome 16, Paris, 1751, partie 2, les mémoires.

² "Nouvelles observations sur l'année des anciens Perses," in *l'Histoire de l'Académie Royale des inscriptions, etc.*, tome 31, Paris, 1768, Mémoires pp. 51-80.

³ *Traité de l'Astronomie indienne et orientale*, Paris, 1787.

⁴ *Revue Archéologique*, 1888-9.

⁵ *SBE*, 47, introd., pp. 42-7.

⁶ *Über das iranische Jahr in Berichte über die Verhandlungen der königlichen sächsischen Gesellschaft der Wissenschaften*, 1862.

⁷ For instance, Spiegel has accepted it in his *Erānische Alterthumskunde*, iii, 670, and even M. in the first part of his *Untersuchungen*, p. 64, has followed that famous scholar.

contribution towards the solving of different questions relating to the Iranian calendar in the said book, as well as in his paper "Das Naurōz", published in the *Modi Memorial Volume* in 1930. Nevertheless, his conjecture on the date of the introduction of the Y.A. calendar in Persia does not solve the difficulties involved by the contradictory indications. Adopting West's method of starting from the contemporary *Kadīmī* Parsi New Year's Day, which, taking into account the four-yearly retrogressions of one day, accords with the well-known fact that the Persian year began on 16th June in the year 632, during which Yazdegerd III, the last Sasanian king, was enthroned, and making it the basis of the backward calculation, he reached almost the same conclusion as West, with only about twenty years' difference. This difference was due to the fact that West had relied on the Persian dates, whereas Marquart like Gutschmid, has rightly preferred the Armenian dates¹ because, as a result of an error committed on the occasion of the first intercalation, namely the omission of the five supplementary days in that year, the Persian dates in a great part of the year were five days in advance compared with the Armenian.² Both scholars, however, have taken it for granted that the Persian year at the time of its adoption must have begun on the vernal equinox, in other words that the first day of the month of Farvardīn was at that time the first day of spring. Therefore West has arrived at the years 510-505 and Marquart at 493-486 B.C. as being the date of the introduction of the Y.A. calendar in Iran. Both authors attribute this important reform to Darius I, who according to them officially established the said calendar in the Persian empire. But it must be stated that the theory of the Persian New Year's Day originally falling on the vernal equinox is not supported by

¹ West also has made his backward calculation by taking back the new year's day 0.2422 day for each year from its present place, which is not strictly accurate for ancient times. M. apparently took the Julian days as his basis.

² The first day of the Armenian year during which the accession of Yazdegerd took place corresponded to 21st June, 632.

Armenian
yr. began with 0° 55'

90° 47' 22" 6480
- 632
= 5848 B.C.

any convincing proof. The idea may have arisen from the impression made on the minds of those acquainted with the Persian calendar by Malikshāh's reform in the eleventh century and the resulting celebration of the Naurūz on the vernal equinox, which prevails in Iran down to the present day. The legend of Zoroastrian cosmogony, according to which the "seven planets" including the Sun in Aries,¹ were in their hypsoma or exaltation points at the beginning of the seventh millennium of world cycles, and Zoroaster's intercalation of the year to bring it back again to the same position (i.e. the sun in Aries on New Year's Day), found partly in Pahlavi works and partly in Old-Arabic books, can hardly be advanced as evidence in this connection.

All the above-mentioned hypotheses about the Y.A. calendar have been based on the supposition that the Persian year, even in Sasanian times, was a vague year of exactly 365 days, without any intercalation whatever in the civil year for making good the difference (of about a quarter of a day) between such a year and the tropic year. This presumption is, however, contrary to our oldest reports of the Iranian calendar by early Muslim astronomers. These reports are expressly to the effect that an intercalation of one month in the Persian year every 120 (or 116) years was more or less regularly carried out in pre-Islamic times.² It was apparently the idea of co-ordinating this tradition with the presupposed adoption of the Egyptian calendar system in Iran in the fifth century that led Cavaignac³ to advance a totally different theory on this matter. This is based on accepting literally the statements of the Muhammadan astronomers regarding the actual intercalation in the Sasanian period even in the Persian civil year, and at the same time admitting the introduction in

¹ According to one version the sun was on the first point of Aries at mid-day of the day *Hormazd* of the month of Farvardīn.

² Only the Pahlavi book *Dēnkart* speaks of a double system and two sorts of years.

³ *JA*, t. 202, 1923, pp. 106-110.

Handwritten notes on the right margin of page 7:

- 170,500
- 49,170
- 1300
- 350
- 240,210
- 2400
- 5150
- 11/20
- 802
- 24042
- 1982

Persia of the Egyptian calendar without any change whatsoever (except, of course, for the substitution of Persian names for the months). The prevalent opinion, as it is well-known, is that there were two sorts of year in use: the civil year which was in general use, and the ecclesiastic, used only for religious purposes, that the first was a vague year, and that the intercalation was limited to the religious year. It is also generally believed that, in adopting the Egyptian vague year, the Iranians changed the year's beginning from the season corresponding at that time to the Egyptian New Year (December) to the vernal equinox. Now Cavaignac, though he admits that the Egyptian calendar was introduced in the fifth century B.C., is of opinion that originally the Persian month Farvardīn, and not the month Dai, stood for the first Egyptian month, namely Toth. Moreover, according to his theory, though this vague year (without any intercalation) possibly has been since used to a certain extent by the mass of people, nevertheless the Babylonian (or the Old-Persian used in the Behistun inscription) remained the official calendar of Persia until the fall of the Achæmenian empire, after which it was superseded by the Syro-Macedonian calendar, which lasted from Alexander's conquest till the rise of the Sasanian dynasty. He thinks, therefore, that it was in the Sasanian period that the Y.A. or Mazdayasnian calendar became the official and general means of time-reckoning in Persia, and that it was in that epoch that the intercalation in the Y.A. year was instituted, after which the year remained nearly fixed during the Sasanian period with the New Year about the time of the summer solstice. He believes also that the intercalary month was inserted at the first intercalation after Shahrivar, the sixth month (possibly in the fourth century A.D.) as a second Shahrivar, and that on the next occasion a second Mihr was added to the year and so forth. As a matter of fact, the beginning of the Egyptian year in A.D. 632 was only ninety days prior to the Persian New Year's Day, the Egyptian being on the 18th March and the Persian on the 16th June, which

difference might be easily interpreted as the consequence of three intercalations of one month each, during the Sasanian period (406 years).

Of all the different theories proposed about the date of the introduction of the Egyptian calendar system in Persia, i.e. the creation or the official adoption of the Y.A. calendar, only two are, I think, more or less consistent with many of the known facts and supported, to a certain extent, by tangible arguments. These are those suggested by Marquart and Cavaignac. But each of these two theories has, nevertheless, its weak points and is far from being satisfactorily established or indisputable. They cannot, therefore, be considered as a final solution of this difficult problem.

Cavaignac's thesis agrees, it is true, in every respect with Bīrūnī's statements¹ regarding the old Iranian calendar, namely that the pre-Islamic year of Persia was a stable or fixed year beginning at (or near) the summer solstice and maintained around that point by a 120-yearly intercalation of one month. But besides being incompatible with the contents of the Pahlavi books on this matter and with other evidence in favour of the vague year,² this theory cannot be brought into harmony with what we know of the parallelism of the Persian year with the Armenian, the Cappadocian, the Soghdian and the Khwārazmian years without the assumption of a very unlikely, if not impossible, condition, namely the general application of exactly the same intercalatory system to all the calendars of these different and often politically separate nations. Moreover, it must be

¹ There are, of course, also similar statements by older, though less famous, writers.

² Such as the changing positions of *gāhānbārs*, the distribution of the months among the four seasons in *Bundahishn* beginning with the spring, *maidhyōishema's* being the season of cutting the grass according to *Visprad*, and its place in the middle of the month Tīr according to *Āfrīn gāhānbār*, and the two apparently different but really identical dates for Zoroaster's death in *Zādsparam*, as well as the correspondence apparently given to the month Bahman and Shahrivar in the Pahlavi commentary of *Vendīdād* (i, 4), and some other data discussed by the present writer in *BSOS*. ix, 1.

pointed out that Bīrūnī himself, who is our principal authority on this subject, is not consistent in this particular point, and his books contain many contradictory passages implying different times for the beginning of the old Iranian year. For instance, his statement regarding the last intercalation, namely that it was the eighth one and that it was executed through the intercalation of a second Ābān, i.e. the eighth month (or a second Ābān and a second Mihr together), can only be based on the supposition of the original *Naurūz* (1st day of the month Farvardīn) having been on or about the vernal equinox, and of the latter having been always considered theoretically as New Year's Day.

On the other hand, the theory of West and Marquart of placing the official introduction of the Y.A. calendar in the Persian empire in the middle or the last part of the reign of Darius I, and attributing this reform to that monarch himself, who according to these scholars established the first day of the year on the vernal equinox, is also irreconcilable with the contents of the *Afrīn gāhānbār* and the *Bundahishn* on this question. According to the first of these two Mazdayasnian literary documents the season festival *maidhyōishēma* corresponds to 15 Tīr. But the *Bundahishn* states expressly that from *maidhyōishēma* till *maidhyāiryā* the night increases, and from *maidhyāiryā* to *maidhyōishēma* the night decreases and the day increases,¹ though this book interprets *maidhyōishēma* to be the 11th day of Tīr (i.e. the first of the five days of that *gāhānbār*) probably following its source not very strictly.² Marquart is certainly right when he expresses

¹ *Bundahishn*, West's translation, xxv, 2-3. Justi's p. 34.

² The real *gāhānbār* day in each of the season festivals of five days' duration is most probably the last or the fifth day. But apparently the author of the *Bundahishn*, notwithstanding the fact that the point of time after which the day decreases and the night increases can only be one day, has considered all the five days of *maidhyōishēma* roughly as the longest days of the year and equal in length. He has perhaps believed these days to be a stationary period, just as he considers the day and night equal in length in all the last five days of the year (in the same chapter). The

the opinion that the Mazdayasnian traditions are in this respect contradictory and that the different passages of the *Bundahishn* are not consistent. For while the summer solstice or the time when the night begins to increase in length is put, as we have seen in the above-mentioned passage, on the 11th day of Tīr (or, rather, strictly on the 15th), it is declared in another passage of the same book immediately following the former that "in the feast of *hamaspathmaēdhaya* that is the epagomenæ at the end of the month Spentārmāt the days and nights are equal [in length]". Nevertheless, his conclusion does not seem to be incontestable. He apparently considers the last-mentioned passage of the *Bundahishn* (relating to the equality in the length of the day and night during the five supplementary days of the year), as well as that part of the former passage implying the identity of *maidhyōishēma* with the summer solstice, as authentic; but he thinks that the gloss placing this *gāhānbār* about the middle of Tīr, and *maidhyāiryā* about the middle of the month of Dai, is a wrong interpretation added by the author of the *Bundahishn* to the original tradition, which was based on the lost parts of the Avesta. Therefore he seems to be of the opinion that *maidhyōishēma* was originally, i.e. at the time of the adoption of the Y.A. calendar, on or about the 1st day of Tīr, and *maidhyāiryā* on or about the beginning of the month of Dai.

Although the original concordance between *maidhyōishēma* and the beginning of the month of Tīr in the Old-Avestan calendar (i.e. the calendar of the Avestan people before the adoption of the Egyptian system) is more than possible, the traditional and rather canonical fixing of the places of *gāhānbārs* in the Mazdayasnian months is, nevertheless, certainly based on the older and authentic sources. These

whole passage relating to the two festivals of solstices must be a faithful quotation from a very much older source (possibly the lost parts of the Avesta) without any interpolation except for the identification of *maidhyōishēma* with 11th Tīr.

places are given in the part of the Avesta called *Āfrīn gāhānbār*. Though it is generally believed that those explanatory passages relating to the places of these season festivals are addenda of later date, interpolated as glosses in the original Avestan text, there is no reason to doubt the antiquity of their contents, which I suppose is as old as the introduction or the official establishment of the Y.A. calendar in Iran.¹ The *gāhānbārs* are thus fixed at an early date in these places and are stabilized in the months of the religious and fixed (*vihejākik*) year.

Relying on the presupposed principle that the Y.A. year originally (i.e. at the time of its introduction or, rather, its official recognition by the State and "Church" in Persia) began on the vernal equinox, I myself two years ago placed the date of the institution of this calendar in the second decade of the fifth century B.C., and have tried to suggest the exact date of this reform.² The reasons for this conjecture are given in a paper read before the International Congress of Orientalists held in Rome in 1935 (section iv, sitting of 26th September), as well as more fully in my above-mentioned Persian book entitled *Essay on the Iranian Calendar*.

A NEW CONJECTURE

A later study of the question, however, has led me to change somewhat my former opinion. The conclusion reached is this. The abandonment by the Zoroastrian community of their traditional Old-Avestan calendar, and by the Persian court and Government of the Old-Persian or early Achæmenian calendar, in favour of the Egyptian system took place during the Achæmenian period. This reform may not have been

¹ This part of *Āfrīn gāhānbār* 3, 9-12, dealing with the length of the six seasons and the places of the festivals in the months is, according to Hertel (*Die avestischen Jahreszeitenfeste, Āfrīnagān*, 3, p. 22), found only in seven out of thirty-one manuscripts of Avesta. Nevertheless, Hertel thinks this is taken from the *Hādhōkht Nask* of the Avesta.

² I have proposed the 28th March, 487 B.C., for the epoch of this reform.

effected in both cases (the "Church" and the State) simultaneously, and most probably one preceded the other by a considerable time. Nevertheless the final union of the two, i.e. the religious community and the court, in this matter must have been accomplished in the first decade of the second half of the fifth century B.C., probably about 441. It was also then, I think, that the beginning of the year was placed near the vernal equinox, and not far from the Babylonian *zagnūg* (New Year's festival) and that the intercalation system was instituted. The reasons which have led me to this conclusion are as follows:—

There is no doubt that the Achæmenian kings used, in the early part of the reign of that dynasty, a calendar based most probably on the Babylonian (perhaps indirectly through the Elamite or Assyrian calendar). Their months were running strictly or almost parallel with the Babylonian months and their year must have been a luni-solar one like that of the Babylonians. The only difference between these two calendars was in the names of the months, and perhaps also in the fact that, while the Babylonian year began near the vernal equinox, the beginning of the Persian year was probably near the autumnal equinox. This last theory, if it should be satisfactorily proved, would suggest that this practice was a survival from that of the early ancestors of this branch of Iranian stock, as the name *sarad* in Avesta and *thard* in Darius's inscription for the year and their similarity with the Indian *śarad* (autumnal season) also may suggest. We shall call this Achæmenian or south-western Iranian calendar here Old-Persian.¹

¹ The idea of the Old-Persian year having been borrowed from a neighbouring people of the West (possibly Elamites), who in their turn might have adopted in much older times the calendar system of one of the Sumero-Babylonian cities which had the autumnal New Year, could also be considered if this last theory about those cities could be proved. Indeed, Hommel (ERE-calendar) asserts that in the oldest forms of the so-called Chaldean calendars, e.g. those used in Ur, Girso, etc., the beginning of the year was in autumn. S. A. Pallis also (*The Babylonian akūn Festival*, p. 30) states that "in the time of Sargon of Agade, Gudea, and partly also

The people among whom Zoroaster preached his new religion and founded the first Mazdayasnian community (whom we may conveniently call "the Avestan people"), on the other hand, appear to have had a totally different system of time reckoning which, there are strong reasons to believe, was an ancient form of the Iranian calendar of early Aryan (probably north-eastern) origin and of a rural character, beginning with or about the summer solstice. This calendar which we shall call in the following pages Old-Avestan has, in many respects, great similarity with the oldest Indian (Vedic) calendar and in some aspects also with the post-Vedic calendar, and both (the Indian and Avestan) may have had a common origin. The year of the Old-Avestan calendar, which seems to have been called *yār*, appears to have been first divided into two main parts, from the summer solstice (*maidhyōishēma* or mid-summer) to the winter solstice (*maidhyāirya* or mid-year) and vice versa, exactly like the old Vedic year, which was also originally divided in the same way into two *ayanas* (*uttarāyana* and *dakṣiṇāyana*).¹ The further division of the year in later

in the time of Hammurabi, the New Year began in Tishritu, and not until after that time in Nisan". He states further (pp. 30-31) that under Hammurabi perhaps the beginning of the civil year was transferred from Tishritu to Nisan, but that "in astronomical calculation, however, the autumnal equinox was still used as the point of departure". But Father Schaumberger, who is a great authority on questions relating to the Assyro-Babylonian astronomy and calendar, informs me in reply to my inquiry that there is only one passage (K 775 = Thompson, *Reports of the Magicians and Astrologers of Nineveh and Babylon*, 16, 5s.) where two different dates (*Nisan* and *Tishri*), i.e. the spring and the autumn, are mentioned as the beginning of the year similar to the Jewish calendar, but that we have no proof for assuming that the Babylonians used in their real life an autumnal New Year. This venerable scholar contests also the actual use of a year of 360 days in Babylon or Sumer (also advanced by Hommel), and says that we have no proof for it though there are some texts speaking of months of thirty days or of a year of 6×60 days, which could be explained by the fact that in Babylonian business documents the months are counted as thirty days.

¹ According to Kaye (*Hindu Astronomy*, Memoirs of the Archaeological Survey of India, No. 18, p. 27), there is in the *Rig-veda* also a division of the year from one equinox to the other called *Devayāna* and *Pitryāna*, but the basis of the Vedic calendar seems to be the two solstitial divisions.

times in India into more and shorter seasons (*ritu*) up to six in number, which took place there gradually, has also great resemblance to the similar division of the year into six seasons (*yāirya rataṇvō*) or *gāhs* among the kindred race of the Iranians, though the Iranian seasons, unlike the Indian, were of unequal length.¹ This later and gradual division of the year in both countries certainly took place as a consequence of the climatic change encountered by Indo-Aryans and Iranians during their migration southwards, and hence the difference in the way of division. The Old-Avestan year began, as already stated, with *maidhyōishēma* or the summer solstice, and was presumably of 360 days with two parts, each of 180 days, like the Indian *ayanas*. The second part began accordingly with *maidhyāirya*, near the winter solstice. The very name of this *gāhānbār*, which certainly means mid-year with its description or its epithet in the Avesta indicating "the cold bringer" (*Visprat*, i, 2; ii, 2), testifies to the year's commencing with summer. Also there is in *Yasht*, viii, 36, perhaps further support in favour of this theory. It is said there that when (or after) "the year [again] comes to the end for men the counsellor princes (? chieftains) and the wild animals, [who] house in the mountains and the shy [animals who] graze (or wander) in the plains, watch [when it (the Tishtrya) is in] rising".² The Tishtrya, which is generally held to be Sirius, had its first heliacal rising in July in the first half of the first millennium B.C. (in north-eastern Iran it rose about 26th-27th July, i.e. four weeks after the solstice). Thus the people might have been waiting and longing impatiently for this rain-bringing star in the first days of the summer. The epithets of the other *gāhānbārs*, as well as the attributes by

¹ The Indian seasons are each of two months and all are equal in length.

² I have followed more or less strictly F. Wolff's translation, with which most scholars agree, but Lommel in his *Die Yāst's des Avesta*, p. 54, gives the translation of the words in italics above as "the annual tilling" (*Jahresbestellung*). If that part of the Avestan word connected with the word "year" should not prove to mean the "end" then the whole argument loses its basis.

which they are qualified in the Avesta, also all agree with these supposed positions of *maidhyōishēma* and *maidhyārya*. Again, the verse of the *Vendīdād* (18, 9) which refers to *Marshavan*, "who could through his wrong religion seduce one to commit the sin of not having devoted (neglecting to devote) himself to the study [of the holy text], continuously for a period comprising three springs (*thrizarēmaēm*)," deserves attention. Could it not be interpreted as suggesting that the spring was the last part of the year, and with the third spring, a period of three full years was completed, which would mean that the year began with summer?

There must have been, in the Old-Avestan calendar, no doubt in practice, some sort of intercalation in order to keep these seasons and the agricultural and religious festivals which were at the end of the seasons more or less in their fixed places in the tropical year. But the way, by means of which this stabilization was achieved, is as little known to us as that by which the old Indo-Aryans prevented the old Vedic year from becoming a vague year. If the year (Old-Avestan) was lunar, i.e. a year of 354 days, then the intercalation must have taken place through the addition of an extra month each two or three years. Apparently this was the opinion of Marquart, who refers to this Old-Avestan year as *also vermutlich ein gebundenes Mondjahr*.¹ The analogy with the old Indian Vedic year and Bīrūnī's report of a year of 360 days in the time of *Pēshdādiān* dynasty,² i.e. in the prehistoric Iranian period, however, make the identification of the Old-Avestan year with this sort of year (i.e. a year of 360 days) more acceptable.³ We may also accept Bīrūnī's statement as to the

¹ *Untersuchungen*, p. 206.

² *ĀB.*, p. 11.

³ The year of 360 days was perhaps the first step in the transition from a lunar to a solar year, being half-way between 354 and 365 days. Some scholars believe that this sort of year existed also in Babylon and Nippur (see note 1, p. 13 *supra*), and there are others who suppose that the vague year of 365 days was preceded also in Egypt in prehistoric times by the same system, though there is no unanimity on this point.

method of stabilizing the Old-Avestan year, namely by the intercalation of one month of thirty days every six years¹ [and perhaps sometimes five years], though a supplementary intercalation of another month each 120 years, which he reports also in the same passage about that calendar, seems to be very unlikely in those ancient times.

This calendar must have been in use when Zoroaster appeared among the people whom we have called the Avestan people, and it must have remained in use with or without some small changes for a considerable time, thus becoming later the calendar of the early Mazdayasnian community. Therefore it must have existed in south-western Iran in the time of the first Achæmenian rulers as the religious calendar of the Zoroastrians of that region side by side with the Old-Persian calendar, which was the official system for the computation of time for the State as well as for the non-Zoroastrian people of that country.

THE FIRST REFORM

The contact between Persian and Egyptian culture which began with the conquest of Egypt by Cambyses in 525 B.C. must naturally have attracted the attention of the rising nation to that old and famous civilization. Darius, who had accompanied Cambyses to Egypt and had stayed there for some years before his accession to the Persian throne, returned to that country, after he became king, in 517 B.C. He took a very great

¹ This sort of intercalation may be a very old Aryan or Indo-European practice. Could not the six yearly feast of the calendar of the Hittites, which Goetze translates as *Sechsjahresfest* (*Kulturgeschichte des alten Orient, Kleinasien*, p. 154), be also a feast of intercalation? If this form of intercalation was really in use, then there would have been no real divergence between the dates of the Old-Avestan years with the Y.A. In this case the Zoroastrians would not have found it difficult at all to change their system to that of the Egyptians, as no real change in the position of days and months was involved. This may also give a clue to the approximate date of the institution of the Old-Avestan calendar or of the said system of intercalation which will be referred to later.

Shyda
Calendar
calculated
4401 B.C.
(p. 13)

interest in the Egyptian nation and their culture, treated the Egyptians kindly, became very popular with them, and was recognized by them as one of their law-givers. It is possible he took a good many Persian nobles, sages, and religious leaders with him to Egypt, and he brought with him, or summoned, to Susa the high priest of the famous *Sais* temple, *Uzahor* by name (according to an inscription now in the Vatican).¹ The intercourse between the two nations which developed particularly with the friendly attitude of Persia towards Egypt and the good feeling felt by the latter toward the former, may certainly have had some influence on the institutions of Persia. Therefore it is not unreasonable to assume that it was at or about this period that the high authorities of the Zoroastrian community in Persia adopted the Egyptian system of time reckoning, and thus introduced the Y.A. calendar. The similarity of principle involved by the theoretical beginning of the year in both cases (among the Egyptian and the Zoroastrian community) on or near the heliacal rising of Sirius may have prepared the ground for a rapprochement in this matter. The original New Year of Egypt was based on the time of the first heliacal rising of the dog-star (Sirius), called by them *Sopdet*, which in ancient times nearly coincided with the beginning of the rise of the Nile.² This was the greatest festival of the Egyptians, for the rising of the Nile was the principal source of their happiness and prosperity. Similarly the heliacal rising of *Tishtrya* (generally believed to be the

¹ Cf. E. Meyer, article "Darius" in *Encyclopædia Britannica*, 14th edition.

² Sirius's heliacal rising for Memphis was according to the latest calculation (Neugebauer's *Hilfsstafeln*) from 3160 to 2640 B.C. on the 17th July, from 1420 to 1050 on the 18th, and from 230 B.C. to A.D. 20 on the 19th July, varying between two consecutive days during the intervals. The Nile's rising in Egypt began, according to Ginzel (*Handbuch der Chronologie*, i, p. 190), in the twenty-eighth century B.C., on 16th July. The Egyptian calendar with its vague year, as we know it, is supposed, according to the latest conjecture, to have been adopted in the same century when Sirius's heliacal rising fell on the 1st *Toth*. This was the 17th July, 2768 B.C., i.e. the day after the beginning of the rise of the Nile.

Avestan name for Sirius), which was looked for as the bringer of much needed rain, the most vital necessity for the Persian cultivator during the season of excessive heat, must have been in that country as great a blessing as the rise of the Nile to the Egyptians.¹ Consequently this point of time (or the first day of the month during which this star rose) had most probably been fixed, as has already been stated, as the New Year of the original people of the Avesta in the pre-Zoroastrian and early Zoroastrian periods.² Moreover, the Egyptian system with

¹ The custom of sprinkling water on each other on the day of the *Tirakân* feast (13th day of the month of Tir-Tishtrye), practised down to much later ages, may have been a survival of its original significance, i.e. the anticipation of the coming rain of which the appearance of Sirius on the horizon at dawn was a good tidings. In the later story of the genesis of the world the creation of the water was put on the division (*gāh*) of the year ending with *maidhyōishema*, which was on 15 Tir.

² It is probable that the month of Tir, which we have assumed to have been the first month of the Old-Avestan year, originally began in the last days of (Julian) July, at about the time of the heliacal rising of Sirius in Northern Iran, and gradually receded until it fell, in the last part of the sixth century, three or four weeks earlier (i.e. it originally corresponded roughly to 28th July-26th August and in 510 B.C. to 2nd-31st July). The verses 13, 16, and 18 of *Yasht* 8, which tell of three consecutive ten-day periods, during which *Tishtrya*, after its rising, fights against *Apaosha*, the demon of drought, may refer to the three decades of the month, as Lommel remarks, (*Die Yäšt's des Avesta*, p. 47) and may confirm the correspondence of the heliacal rising of *Tishtrya* with the first day of the month of the same name. As a matter of fact, the decrease of the heat and the beginning of the rain is quite natural thirty-three days after the heliacal rising of Sirius in the northern regions of Iran. This would correspond to about 22nd August (Gregorian). The retrocession of the month Tir against the tropic year may have been due either to the deficiency of the unknown system of intercalation used in the Old-Avestan calendar, or may have been caused by the abandonment of the sidereal year in time reckoning. The retrocession may have been slow or fast, according to the extent of the difference of the year with the real solar year (tropical). Having no information as to the rate of this retrocession, we cannot discover the date of the original correspondence between the first day of Tir and the heliacal rising of Sirius, which was probably also not far from the date of the original composition of the oldest part of the non-Zoroastrian nucleus of that older *yasht* (*Tishtrya Yasht*). With a year of 360 days and the intercalation of a month each six years this would take about a century or a little more, and if this kind of calendar really preceded the Y.A., its institution (or, at least, the original composition of that part of the said *yasht*) can be reasonably put in the second half of

Y.
Apap
Apa-ashma

2768
1461
4229

4229 B.C.

1461

5690 B.C.

a year of a fixed number of days (365) without intercalation (for the omitted fraction of day) may have appeared to the minds of the Zoroastrian priests, especially for liturgical purposes much simpler and more convenient than their own. Consequently they adopted that system and introduced the so-called Young-Avestan calendar into the Zoroastrian church and community. This community may have been by this time encouraged, and perhaps even favourably regarded and supported by the court, following the anti-Magi policy of Darius after the slaying of the Magian usurper and general massacre of this caste in 522 B.C.

Thus the reform consisted in giving up the Old-Avestan calendar and copying exactly the Egyptian vague year in all respects even in the place of the New Year. The Zoroastrian community adopted the same system of twelve months of thirty days each, with a yearly intercalation of five days at the end of the year instead of making up for the deficiency of eleven or five days in their former year, by a three- or six-yearly intercalation. They kept, however, the essential and most important parts of their former calendar, namely the natural and religious season festivals or *gāhānbārs* and, of course, they replaced the Egyptian month names by the Old-Avestan (pre-Zoroastrian) month names or (in most cases) by the names of their own supreme deity and archangels.¹

the seventh century B.C. As the full visibility of Sirius in the Eastern horizon at dawn by everybody may be sometimes later than the date of its first heliacal rising, according to the astronomical calculation (see Ginzel, iii, p. 368), this would put the date of the first rain still later towards the end of summer and hence more in keeping with actual conditions in Northern Iran.

¹ As to the question whether the months with the names of *Tishtreya*, *Mithrahe*, and *Apam(napātō)* existed in the Old-Avestan calendar, and were not changed in spite of these names being unpopular with the early followers of Zoroaster, or they were received into the Y.A. calendar on the occasion of the second reform (see *infra*), there is no tangible evidence in favour of one or the other theory. In the second case the introduction of these names must have followed the admittance of these non-Zoroastrian deities into the Mazdayasnian pantheon. It is possible that the months with these

If the Zoroastrian names of some months were already in use, the month of the highest divinity (Ahura Mazdā), which was till then the seventh month of the year, i.e. at the beginning of the second half-year, coincided at that time with the first Egyptian month Toth, and both corresponded, roughly, to the first month of winter. Therefore that month became the first month of the new calendar. If, however, the month names of the Y.A. calendar were introduced at the same time as the calendar itself was adopted, then it was natural that the first month of the new calendar should be named after the same highest divinity *dadhvā* (modern Dai), the epithet of Ahura Mazdā.

The order of the *Amesha Spentas* in the month names which has so far puzzled the scholars may, I think, be explained as follows: Putting the month of the creator on the top (the beginning of the year), the order of the Archangels is followed, not according to their well-known and familiar succession, but according to their range in sitting before the throne of Ormazd in the heaven on each side in accordance with their age and sex, as given in the *Great Bundahishn*. Their sequence is only broken now and then by the months consecrated to the older deities. After the supreme divinity comes first *Vohu Manah* from the right hand, then *Spenta Armaiti* from the left, then (interrupted by a non-Angelic month) *Asha Vahishta* from the right, then the twin Angels *Haurvatāt* and *Amərətāt* from the left (though separated again by a stranger) and then at last *Khshathra Vairya* from the right.

The Egyptian habit of naming their months and days after different divinities also was not apparently without influence in the denomination of the new Mazdayasnian months and days. The name of the first day of the Egyptian months was identical with the name of the first month, likewise in the Y.A. calendar the first day of every month is named *Aurmazd* (*Ahurahe Mazdao*), which is the name of the supreme God, whose epithet was *dadhvā* (gen. *dathushō*), the patron of the first month. Again the consecration of the five supplementary days at the end of the year and perhaps also the 19th day of

names belonged to the older and popular calendar of Iranian peoples other than the Avestan, especially the Western Magian community, who went over later to Zoroaster's faith. The form of the name of the fourth month (Tr) in the calendar of all the peoples using the Y.A. year may be supposed to point to its Old-Persian origin and to suggest that it was received into the Y.A. calendar in the Persian period.

the first month ¹ to the reverence of manes in both calendars (Egyptian and Y.A.) does not seem to be wholly incidental.

Now, if we assume the date of this reform as being about 510 B.C., we shall obtain the following correspondences: the Egyptian year began at that time on 29th December (Julian) and consequently the beginning of the Iranian year, i.e. the first day of the month Dai, which corresponds to the first day of the Egyptian month Toth, must have been placed also at the same point; the summer solstice fell on the 29th June ² and the third day of the month Tīr, about when the first day of the lunar month in that year (509 B.C.) also began ³; the Egyptian epagomenæ as well as the Persian *andargāh* or *gāthā* days (five supplementary days of the year) were after the Egyptian month, *Mesori* (twelfth month), and the parallel Persian month, Ādhur, respectively, and corresponded to 24th–28th December; the month Tīr corresponded to 27th June–26th July, and thus the heliacal rising of Sirius in Iran could have fallen in this month. ⁴

¹ The 19th day of the month *Farvardīn* (the first month of the year in later periods) is called *Farvardīgān*, i.e. by the same name as the five supplementary or *gāthā* days. It is possible that in the first period the 19th day of the month Dai (then the first month of the year) bore this name and was consecrated to the same duties as the 19th Farvardīn in later times. The possibility of the transmission of the name from one to the other on some occasion of the eventual concordance between the two is, from a practical point of view, very remote.

² More strictly at about 2.30 a.m. of that day in Iran.

³ The new moon was in Iran on 26th June about 6–7 o'clock p.m., thus the day following the first visibility of the crescent was, most probably, the 29th June.

⁴ According to Nöther's calculation (Geiger, *Ostiranische Kultur*, p. 309) in the regions with 38° of latitude, Sirius must have risen in the middle of the seventh century B.C. on the 1st day of August at 3.3 a.m. Accordingly the time of its rising on 26th July at the end of sixth century B.C. will be approximately 3.20 a.m. and on the 1st July about 5.10. Thus the first appearance of this star at dawn could have taken place in the last part of Tīr. Had the Y.A. year originally, i.e. at the time of its introduction in Persia, begun with the first day of Farvardīn and the vernal equinox, as some prefer to believe, the month Tīr would have corresponded to 25th June–24th July, which brings it to a still earlier date and makes the heliacal rising of Sirius in this month more questionable.

If there is any truth in the tradition reported by Birūnī (*ĀB.*, pp. 233–4) to the effect that, after the coming of Zoroaster and the [later] transfer by the Persian Kings of their residence from Balkh (Bactria) to Fārs and Babylon, the Persians paid [special] attention to matters relating to their religion, renewed their astronomical observations, and found that in the third year from the [last] intercalation, the summer solstice preceded the beginning of the year by five days, and that they then gave up the older reckoning and adopted the results of their new computation, the explanation may be as follows: by adopting the Egyptian system, an adjustment in the position of the Iranian months in use up to that time was perhaps carried out. The mere act of making the Iranian year conform with the Egyptian by making the seventh month of the Old-Avestan calendar (the later Dai) parallel (i.e. in full and strict correspondence) with Toth, the first Egyptian month, would have necessarily caused a shift in the places of the other Iranian months. For instance, if the month of Tīr, which according to our theory was the first month of the Old-Avestan year, normally ought to have begun on, say, 2nd July, given that the reform had not taken place in that year, it was bound to move a few days back when the first day of Dai was put at the same position as the first day of the Egyptian Toth (about 29th December), making Tīr to correspond to the Egyptian *Phamenoth* (27th June–26th July).

This hypothesis will also explain the position of the month of Dai which, according to this, was originally in its logical and right place as the month of the supreme God, whereas, in the later order of the months in the Y.A. year, its position (the tenth month) always seemed anomalous. It will account also for the unexpected length of the *gāh* (*yāirya*) ending with the *gāhānbār* of *maidhyāirya* (eighty days instead of seventy-five) and the traditional place of this *gāhānbār* on the 20th day of Dai (celebrated from 16th to 20th) instead of 15th, which was to be expected as the second pole of the Old-Avestan year opposite to *maidyōishama* on 15th Tīr. Both these points can thus be explained. As it has been stated, the Egyptian epagomenæ being at the end of the year and immediately preceding the month Toth, the Persian *andargāh* should have taken their place at the end of the month Ādhur immediately before the month Dai. This would have made the interval

between the 1st Tīr and the 1st Dai 185 days instead of 180 days, which was according to our assumption the original interval. Consequently the length of the last *yāīrya* (*gāh*) of the year ending with *maidhyāīrya* would have increased from seventy-five to eighty days. In the second and last reform, however, when the Y.A. calendar was officially recognized by the State and was made the civil calendar of the empire, the *gāthā* days were removed from the end of Ādhur to the end of Spendārmāt, which was fixed at that time as the end of the year. But the length of the *yāīrya* from *ayāthrima* to *maidhyāīrya* was not readjusted accordingly and still remained in Persian reckoning eighty days in length. Therefore the *maidhyāīrya* had advanced five days from its usual place in the month of Dai, which must have been at that time on the 15th of that month, to the 20th of the same month where it was then stabilized (in the religious or *vihējakīk* year).¹ The Khwārazmians, unlike the Persians, carried out correctly the necessary adjustment due on this account, as appears from the length of the intervals between their *gāhānbārs* corresponding to the Avestan and Persian *ayāthrima*, *maidhyāīrya*, and *hamaspathmaēdhaya*, i.e. *arhamān* (?), *binkhajāchī raid* (?), and *maithsokhan raid* (?) respectively. The interval between the two former is (*ĀB.*, p. 237–8) seventy-five days, and between the second and the last, eighty days. This may point to the antiquity of the Khwārazmian calendar compared with that of the Armenians or the Cappadocians, etc. The positions of the Khwārazmian *gāhānbārs* differ from those of the Persian by five months, and from the original places given in *Āfrīn-Gāhānbār* by three months. This fact may suggest that the Khwārazmians followed the Persians in the matter of intercalation up to the third one (presumably executed about 81 B.C.), after which the former

¹ In most cases throughout these pages it is the last of the five days of each season festival which is meant by the *gāhānbārs*, as this is generally believed to be the real or the main day of the feast.

ceased to intercalate, perhaps in consequence of the weakening of the cultural relations between the two peoples, following the Scythian invasion of Bactria and the adjacent countries about 130 B.C.

* * *

THE SECOND REFORM

The positions of the *gāhānbārs* in the Y.A. calendar are not easy to explain and have been the subject of much discussion. If the Y.A. year originally (i.e. at the time of its official adoption and the institution of the intercalation system) began with the vernal equinox and the month of Farvardīn, the *gāhānbār* of *hamaspathmaēdhaya* would have then fallen on the last day (or days) of winter, but then *maidhyōishēma* (or the midsummer festival) with its traditional place on 15th Tīr would not have corresponded either with the middle of the well-known summer of three months or with the middle of the bigger summer of six months, i.e. the brighter and warmer half of the year from the vernal to the autumnal equinox.

The explanation proposed by Cama¹ for the apparent lack of harmony in the arrangement of the places of the *gāhānbārs* in the year, which was considered for some time by most scholars to be satisfactory, is also open to some objection. Cama tried to find the solution of this rather peculiar arrangement by ascribing the institution of the different *gāhānbārs* to different periods. According to him, in the early times, when the year was divided into two parts only, namely a summer of seven months and a winter of five months, four *gāhānbārs*, viz. *maidhyōishēma*, *ayāthrima*, *maidhyāīrya*, and *hamaspathmaēdhaya* were created as the feasts of the middle and the end of the said Avestan summer (*hama*) and winter (*zyam* or *zayana*) respectively. But the other two, i.e. *maidhyōizarēmayā* and

¹ K. R. Cama, *Actes du VI Congrès International des Orientalistes*, 3, 583–92.

paitishhahya were introduced in later times after the well known four seasons of the year, each of about three months, had come in use, thus marking the middle point of the spring and the end of the summer (of three months) respectively. Apparently Cama also believed that the Mazdayasnian year began originally on the vernal equinox, as his explanation of the places of *maidhyōizarmaya* and *paitishhahya* shows.

That the *maidhyōishēma* originally corresponded, as is implied by the literal meaning of the word, to the middle point of the Zoroastrian summer of seven months is, no doubt, indisputable,¹ though this "Zoroastrian summer" meant only the 210 days' interval between *hamaspathmaēdhaya* and *ayāthrima*, without implying by any means a stable correspondence between the first of these two *gāhānbārs* and the day immediately preceding the vernal equinox. It is also true that the *gāhānbārs* were not all instituted simultaneously. Also it must be admitted that in the later Sasanian times, as well as in the early centuries of Islam, the original position of the *vihejakik* month Farvardīn was considered as corresponding to the first month of the spring.² But as stated above, this theory of the first day of (*vihejakik*) Farvardīn being on the vernal equinox does not agree with the statement of the author of the *Bundahishn* regarding the increasing of the night and decreasing of the day from *maidhyōishēma* onwards, or with the epithets given to the *gāhānbārs* in the Avesta (*Visprat*, i, 2; ii, 2). *Maidhyōishēma* is described there as the time when the mowing of the grass takes place, *paitishhahya* as the time of the harvest of the corn, and *ayāthrima* as the season of driving

¹ J. Hertel, however, believes that the positions of *maidhyōishēma* and *maidhyāirya* were in early times the reverse of their later positions and that through a later reform they interchanged their places in the year (see his work *Die avestische Jahreszeitenfeste*).

² *Bundahishn* gives Farvardīn, Ardibihist, and Khordād as the three months of the spring (Justi's translation, p. 35), but this and similar records point only to the conception prevalent in later times, originating in the post-Sasanian period. I think all these possibly go back to a reform carried out in the time of Sasanian King Fīrūz (457-84), to which reference will be made in the following pages.

the cattle home from summer pasturage (i.e. the time of retiring from the field into winter dwellings) and of the mating of the sheep (also *Yasna*, i, 9; ii, 9; iii, 11; iv, 14). If these *gāhānbārs* were originally celebrated, as the equinoctial theory of the new year implies, on the 150th, 180th, and 210th days after the vernal equinox, which dates correspond roughly to the 3rd July, 16th September, and 16th October respectively in the Gregorian calendar, the seasons would have been too far advanced in Iran for the agricultural and pastoral occupations attributed to them to have been carried out, as Marquart rightly pointed out in the case of the two latter (*Untersuchungen*, p. 205). Therefore we may reasonably hold to the description of *maidhyōishēma* in the *Bundahishn* as the starting point of the shortening of the days and the lengthening of the nights, and put it on the summer solstice or the middle point of the longer summer (the warmer half of the year). We may also at the same time admit as correct the place given to this *gāhānbār* in the Mazdayasnian year in the Avesta, namely 15th Tīr (*Āfrīn-Gāhānbār* 7-12, Wolff's translation of the Avesta, p. 303).¹ This agrees also with the place given to it in the *Bundahishn*, except that the latter book is less strict when it places the beginning of the shortening of the diurnal arc on the first day of the five festival days (11th Tīr) instead of the last (15th), which is the real *gāhānbār* day.

Undoubtedly it was these considerations that led Roth² to suppose that the beginning of the old Iranian year (1st Farvardīn) was originally on 8th March (Gregorian), and Bartholomæ,³ Geiger,⁴ and others have followed him in this

¹ As it is said this part of *Āfrīn*, which in some manuscripts gives the dates of the days and months of the *gāhānbārs* or season-festivals in the *vihejakik* year and months, is believed to be a later addition. Nevertheless, its original source at least must have been composed not later than the date of the first intercalation (presumably in the last quarter of the fourth century B.C.), if not as early as the time of the institution of the intercalary system and the stabilization of the *vihejakik* year in the middle of the fifth century.

² *ZDMG*, 34, p. 701.

³ *Altiranisches Wörterbuch*, pp. 160, 838, 1117, 1118, 1776.

⁴ *Op. cit.*, p. 322, where he puts it on 9th March.

supposition.¹ This comes to thirteen days before the vernal equinox. This was the position of the Y.A. year in the third quarter of the fifth century B.C.

This theory explains satisfactorily many difficult points mentioned above, relating to apparent anomalies, and it agrees with almost all our data on this matter. The only remaining difficulties are in: (1) the passage of the *Bundahishn* indicating the equality of the length of the day and night at the time of the festival called *hamaspathmaēdhaya*, to which reference was made above, and (2) the meaning of the word *maidhyōizaremayā*, which is supposed to be mid-spring. Both these points, if they cannot be otherwise explained, may imply that the year began on the equinox, and could be advanced as evidence in support of that opinion. L. Gray tries to explain this inconsistency in the tradition by supposing that "the year originally began with the vernal equinox, and solstitial festivals were introduced later when the actual beginning of the year had receded by thirteen days (i.e. to 8th March)".² But as the *gāhānbārs* had nothing to do with the civil (*Oshmartik*) year before A.D. 1006, and as their places were fixed in the *vihejakik* or fixed religious year, they must have been established in the places given in the *Āfrin Gāhānbār* according to their positions in one particular year, and not according to their individual positions in separate years. For if the place of *maidhyōizaremayā* had been originally, on the forty-fifth day after the vernal equinox, it would have fallen on 28th Ardibihisht, when the beginning of the civil year had receded thirteen days in the tropic year.

Therefore all the six *gāhānbārs* must have been stabilized in their traditional places in the (*vihejakik*) Y.A. year simultaneously when the intercalation was introduced. Consequently these places represent the positions which these

¹ They did not say, however, what they meant by "original position" and have not proposed a date for this original year, though this naturally implies a certain point of time after which the year should have become vague and altering its position with respect to the tropic year.

² Jackson, *Zoroastrian Studies*, pp. 128-9.

season festivals happened to occupy in the civil or the vague year at that date, i.e. they had reached those places on account of the retrogression of the civil year against the tropical year. These festivals then became fixed, being celebrated always on the same days of the *vihejakik* or religious year, as registered in the *Āfrin Gāhānbār*, and corresponded thus approximately always with the same astronomical positions in the tropic year but advanced in the civil year.¹

The statement as to the equality of the day and night on *hamaspathmaēdhaya* occurring in the *Bundahishn* was in all probability due to a misunderstanding caused by the later popular belief in the equinoctial beginning of the original year, an opinion possibly having its origin in Zoroastrian mythology and cosmogony, as already stated, which also, in its turn, may have been influenced by the Babylonian *zgmūg*.² As to the meaning of *maidhyōizaremayā*, even if it could be proved that the word *zaremayā* means spring, it is by no means certain that it represented strictly the astronomical spring. This is very unlikely, since such a notion (the division of the year into four equal parts as it is at the present day) hardly existed among the Avestan people.³ It may rather have been a name for the earlier part of the Avestan summer, which was seven months long, from *hamaspathmaēdhaya* till *ayāthrima*. In the long interval between these last-named festivals some other holidays for rest and offering, besides *maidhyōishama* in the middle, may have been considered necessary. Therefore the forty-fifth

¹ The *gās*, under the influence of intercalation, fell one month later in the civil year, after each intercalation. With the last intercalation they reached to points eight months posterior to their original places: e.g. *maidhyōishama* corresponded then to the 15th day of the month of Asfandārmadh of the civil year as B. and others give it.

² This belief may have its origin in, or have become general as the result of, a reform at the time of Fīrūz, which will be discussed in this article.

³ The word *vanhar*, which is perhaps from the same root as the Indian *vasar*, must have also been used for spring, not in its strictly technical meaning, beginning with the vernal equinox and ending with the summer solstice, but, as in common parlance, for the period of verdure and blossom.

day of this interval or the end of the first three units¹ of time reckoning was added to the already existing season festivals, and it was made a holiday of the season of milk, honey, and juice. Thus this *gāhānbār* was probably instituted much later than the other *gāhānbārs*, just as the Indian *vasanta* (or *vasara*) was most probably introduced later than the other seasons. This Iranian festival which was celebrated sixty days before the summer solstice and corresponded to 24th April (Gregorian), was called *maidhyōizaremayā* or (roughly) the middle-point of spring in the popular (and not astronomical) sense of the word, i.e. the season of the revivification of nature and vegetation.² It is curious that *Thuravāhara*, the name of the Old-Persian month, corresponding to the second Babylonian month *Iyyār*, means also mid-spring, and that in 441 B.C., when according to our conjecture the Y.A. calendar was made the official calendar of Persia, the first day of this month coincided with the 15th day of Ardībihisht, which has been stabilized as the *vihejakik* day of *maidhyōizaremayā* in the

¹ The Old-Avestan year seems to be considered as composed of units of time, each fifteen days or a fortnight long. This is perhaps a remnant of the earliest and primitive time-reckoning of the Iranians by half-months. Consequently the year consisted of twenty-four fortnights, arranged in groups of three, four, five, two, five, and five, each of the groups being one of the six seasons or *yāiryas* (the fourth one, however, being supplemented later by five days as epagomenæ):

² In *Yasht* 7. 4, there is mention of *zaremaēm paiti*, "when the moon brings the warmth with its light, the greenish plants shoot always towards the spring on the earth". The Pahlavi book *Dātistān i Dēnīg*, 31, 14 (West's translation) speaking of the Ardībihisht (of course, the *vihejakik* month) says that the name of this month in religion (i.e. in Avesta) is *Zaremiya* and in this month the butter of *mēdhiōk-zarem* is produced. This expression (*zaremayā raoghna* = the butter of *zaremayā*) is also used in the verse 18 of the so-called *Yasht* 22 of the Avesta (SBE, iv, Darmesteter's English translation of the Avesta). That the beginning of the year or season was not on the point of the vernal equinox in the strict sense among the less advanced peoples is also to a certain extent due to the difficulty of ascertaining the time of the equinoxes by simple and ordinary means. B. is perhaps right when he asserts (*AB.*, p. 216) that for the primitive peoples the observation of the solstices is incomparably easier than that of the equinoxes, which needs an advanced knowledge of astronomy and astronomical instruments, whereas the solstice can be found out by the simpler method of using a gnomon.

Mazdayasnian year.¹ It must also be noted that the spring in most parts of Persia is very short and that the weather changes from cold to excessive heat with a short interval between the two.

The truth about the Old-Avestan season festivals is that although they had their fixed places in the tropic year, they had nothing to do with the well-known astronomical four seasons now in general use. None of them is based on one of the four main points of the tropic year (equinoxes and solstices) except *maidhyōishama* which, as the beginning of the year, corresponded in principle to the summer solstice and was the fundamental point of the year and the basis for the calculation of all other seasons. *Maidhyāirya* was not the name for the winter solstice, but since it was the middle point of the year, which is the meaning of its name, and came 180 days after *maidhyōishama* at the beginning of the second half-year, it fell naturally on (or strictly speaking about) the opposite solstice or the second pole of the year. Then counting backward and forward from *maidhyōishama*,² the point 105 days or seven fortnights before it was made the first day of the Avestan summer, and the day preceding this last point was made a season festival called *hamaspathmaēdhaya* as the end of retirement, or the end of the off-season, and the beginning of outdoor or field work, and in the same way the point 105 days after *maidhyōishama* was considered as the end of the summer (the festival of

¹ This festival is apparently the same as *jashn-i vahār*, which was celebrated "forty-five days beyond New Year's Day at a place becoming specially noted where people went from many quarters out to the place of festival (*yasno kār*)" and whereto Zoroaster has proceeded (Selection of Zād Spāram, West's translation, *SBE*, xlvii, p. 154). If this tradition is old and authentic it indicates that this festival, though comparatively of later origin, nevertheless existed in Zoroaster's time and was celebrated with full attendance. The translation of the passage of *Zartusht nāmeh* relating to this festival by Wilson (*The Parsi Religion*, Bombay, 1843), however, does not agree fully with putting it in the second month of the year.

² Exactly as the Khwārazmians of the tenth century, according to B. (*AB.*, pp. 236, 237, and 241), used to count from the day *Ajgār* (most probably in origin the Khwārazmian *maidhyōishama*) in both directions for fixing the seasons for all kinds of agricultural work.

ayāthrima). Thus the Avestan winter began, in the same way, seventy-five days or five fortnights before *maidhyāirya* and ended seventy-five days after it. Consequently *maidhyōishēma* became the middle point of the Avestan summer of seven months (mid-summer) which now had three festivals: one at the beginning (or, rather, the day preceding it), one at the end, and one at the middle. The winter, being shorter, was divided in two equal parts forming only two *yāirya*s (*gāhs*), but the summer, being longer, a further division took place¹ and two more festivals were created, viz. the festival of the harvest (*paitishahya*), seventy-five days after *maidhyōishēma*, and the festival of high spring or the season of milk, butter, honey, and blooming countryside (*maidhyōizərəmāya*), sixty days before it.

Now it is possible that the Zoroastrian community, a considerable time after the adoption of the Egyptian calendar system, noticed a change in the position of their most important festivals. This change was bound to take place as a consequence of neglecting the necessary intercalation that was due on account of the omission, each year, of a quarter of a day by which the real solar year (tropie) exceeds the vague year. They realized then the necessity of some sort of intercalation which, while compensating for the accumulated shortages caused by omitted fractions would not interfere with the order of the days in the months, and would cause no divergence between the intercalated and the vague year in the names of the corresponding days. The addition of a thirteenth month to the year was already known to the Persians from the Babylonian calendar, also most probably from the Old-Persian and the Elamite, as well as perhaps from the Old-Avestan calendars. The intercalation of a month once each 120 years would bring back every day of a vague year to the same Julian day to which it had originally corre-

¹ Summer being the season of work for agricultural people, many holidays for rest were, no doubt, needed, contrary to winter, which was the off-season.

sponded, though not exactly to its original place in the tropical year.

The establishment of such an intercalation, which means the adoption of the *vihējakik* (fixed) year, was probably simultaneous with the transference of the year's commencement from the month Dai to the month Farvardin. Consequently the established correspondence between the Egyptian and Persian New Year was abandoned, and the Persian year began from that time not far from the Babylonian *rēsh shatti* and its feast *zagnūg*. This reform was an important step, and it was possibly connected with some special factors. The successive revolts of Egypt, the killing of the Persian Governor there, followed by a long struggle during the first years of Artaxerxes, and the hatred of the Egyptians for this monarch and his father on the one hand, and the growing intercourse and rapprochement between Persians and Babylonians on the other, are perhaps among the possible factors of the change.¹ Artaxerxes I, whose residence was in Susa, where Nehemia took leave from him in 445 (*Nehemia*, i, 1), transferred it later (perhaps owing to the destruction of his palace by fire or to his conversion to a new faith (?)) to Babylon, where Nehemia found him again in 433 (*Nehemia*, xiii, 6).² The court remained in Babylon apparently for the most part until Artaxerxes II moved again to Susa after 395.³ But besides this and similar reasons for the reform of the calendar, can we not seek the decisive factor in the conversion of the Achæmenian rulers to the Zoroastrian religion? If

¹ A parallel is to be found in the Jewish fast of *'āshūrā* adopted at first by Muslims, but changed later to the month of *Ramaḍān* when their relations with the Jews became unfriendly.

² That Nehemia's patron was the first Achæmenian king of this name and not the second is, I believe, proved by the Aramaic papyri of Elephantine cf. Schäfer, *Ezra der Schreiber*.

³ This fact (the settlement of the court in Babylonia for more than half a century) may account for many other tendencies in the Achæmenian empire, and perhaps among others for the adoption of the Aramaic language as the official means of correspondence in the imperial chancellery and State departments.

this supposition should prove to be correct, then it must have been on this occasion that a compromise was effected by which the Zoroastrian New Year's feast was brought more or less into harmony with the Babylonian *zgmūg*, and the Old-Persian feast of Mithra was taken into the Avestan calendar. Thus the court would have given up the Old-Persian and adopted the Mazdayasnian calendar except for the beginning of the year. In this last matter the Zoroastrian priests seem to have made a concession to the desire of the king by fixing the New Year near to the vernal equinox, and more particularly by the incorporation into the Mazdayasnian year, of the feast of Mithra, which appears to have been the greatest festival of the South-Western Iranians and of the Achæmenians, and by officially recognizing it. Also the Zoroastrian composition of some of the older *yashts*, of which (or at least of parts of which) a non-Zoroastrian or perhaps even pre-Zoroastrian nucleus may have already existed among the Magian communities of Media and Persia as hymns of praise to older Aryan deities or as mythological songs and epics, may have been connected with this epoch-making change. It was then that the incorporation of these materials in the supplemented and enlarged sacred book took place, as well as the adoption of the said ancient and non-Zoroastrian popular divinities such as Mithra, Anāhita, Tishtrya, and Verethraghna (who were perhaps the *daevas* of the early and pure Zoroastrian faith) into the religion and its revised canon.¹

The *Āfrīn Gāhānbār* or, at any rate, its supplementary part dealing with the lengths of the *gāhs* and with the days and months of the season festivals represents this period, and the basis of it at least must surely have been composed at this time, i.e. about 441 B.C.² Although the contents of this *Āfrīn*

¹ The mention of Babylon in *Yasht* 5, 29, fits in with the removal of the seat of the government or of the court from Susa to Babylon by the first Zoroastrian king, Artaxerxes I, the Constantine of that faith. The same *Yasht* contains the name of Anāhita, which may also increase the probability of its composition in that period.

² Or at any rate before the first intercalation of the Persian year.

are believed to be derived from the Hādhōkht Nask of the Avesta, that part of them which concerns the six seasons of the creation and their length, is repeated more fully in the cosmogonical chapters of the *Gr. Bundahishn*, which no doubt are based on the *Dāmdāt Nask* of the lost Avesta. Through comparing a tract of the pseudo-Hippocratic Greek work (*De hebdomadibus*) with the material of the *Gr. Bundahishn* on microcosm and macrocosm taken from the said *Dāmdāt Nask*, Albrecht Götze (*Zeitschrift für Indologie u. Iranistik*, ii, 1923, pp. 60 and 167) has proved that this *nask* must have been composed not later than the fifth century B.C.¹ (Reitzenstein proposes 430 as the lowest limit, *Studien*, p. 130 n.). Perhaps the absence of Mithra, Anāhita, etc., in the inscriptions of early Achæmenian kings, including that of Artaxerxes I belonging to the early part of his reign, and the appearance of these deities in the next inscription of any length (that of Artaxerxes II) can also be explained by this theory,² i.e. the conversion of the Achæmenians to Zoroastrianism between the two dates. The absence of the name of Zoroaster from the books of Herodotus (composed about 447 B.C.) and its mention in *Alcibiades*, i, of Plato (about 390 B.C.) may also indicate that the faith of the Iranian prophet had become the State religion during that interval.³

¹ Cf. R. Reitzenstein, "Plato u. Zarathustra" (in *Vorträge der Bibliothek Warburg*, 1927) and *Studien zum antiken Synkretismus*, 1926, as well as H. H. Schäfer in the last-named volume.

² The mention of these deities in the inscription of Artaxerxes Mnemon or the report of Berossos about his special attachment to the same divinities does not necessarily imply that they were first recognized during the reign of this monarch, as is often held. This recognition might have taken place at any time between the unknown date of the inscription of Artaxerxes Macrocheir and that of Mnemon, unless some long inscription should be discovered belonging to the later part of the reign of the former king or from the reign of Darius Ochus, praising Ahura Mazdā and ignoring Anāhita, Mithra, and others.

³ As Benveniste remarks (*The Persian Religion according to the chief Greek Texts*, 1929), this is "the first definite mention of the name of Zoroaster in

FURTHER EVIDENCE SUPPORTING THE SAME THEORY

The following considerations may help to make the date suggested as that of the second reform of the calendar more acceptable:—

1. Herodotus, who wrote his book in the early years of the second half of the fifth century B.C., although he speaks of the Egyptian year and finds it preferable to the more complicated year of the Greeks (ii, 2; Rawlinson's translation, ii, 3), does not mention the Persian year as having the same simplicity as the Egyptian. It may be inferred from this omission, as Marquart has pointed out, that Herodotus did not know the Y.A. calendar of the Persians. Ctesias's mention of the feast of Mithra in Persia, at which even the king could get intoxicated,¹ is, on the other hand, possible evidence of the existence of the new calendar to which the festival he thus names (most probably the well-known *Mithrakān* or *Mithrakana* of Strabo) apparently belonged, in the last years of the fifth century B.C. when he was in Persia.²

2. The last of the intercalations (of a month each 120 years) took place, according to Birūnī (*ĀB.*, pp. 33, 45, 118 and 119) in the reign of the Sasanian king Yazdegerd I (A.D. 399–420). This was the seventh intercalation when the seventh month (Mīhr) had to be repeated according to the established rule. On this occasion two successive intercalations (the seventh and eighth) were carried out together, one which had already

Greece". The passages attributed to Xanthus the Lydian relating to the date of the Iranian prophet or to the recalling of his words by Persians when they were going to burn Croesus are of doubtful authenticity. Even if they proved to be authentic, they would not imply the adherence of the Persian kings to Zoroastrianism, but would only suggest that Xanthus knew the name of the Iranian reformer whose new religion had gradually been spreading (westwards) in Iran for some hundred years before his time. Clemens puts the composition of *Alcibiades* after 374.

¹ Athenaeus, *Deipnosophists*, x, 434. (English translation by Charles Burton Gulick, 1927, bk. iv, p. 469). Duris (according to the same source) adds also the permission for the king to dance.

² He was there apparently from 414 till 398 and wrote probably in 390.

fallen due and the other in anticipation. This double intercalation had to be effected by repeating the months Mīhr and Ābān in the same year, making it a year of fourteen months. Therefore the epagomenæ were placed at the end of Ābān, where they have remained till A.D. 1006, and in some provinces until much later. Now the seventh 120-yearly intercalation must necessarily have been on the 840th year after the institution of the intercalation. As a matter of fact, the 840th year after 441 B.C., the date we have assumed for the establishment of the *vihējākīk* year, is A.D. 399, which is also the first year of Yazdegerd's reign. It is true that Birūnī is not consistent in his statements in his different books about the date and number of the last and double intercalation. Apparently he considers this intercalation in his above-mentioned book (*ĀB.*, pp. 33 and 119) as the eighth and ninth together and he says that all traditions are unanimous in putting it in the reign of Yazdegerd I, but it is to be implied from his calculations in the *Qānūn-i Mas'ūdī* (composed about twenty years later) that this last intercalation was the seventh and eighth together, and he asserts that it was carried out during the reign of Firūz (A.D. 457–84). Nevertheless, there are reasons for believing that from a chronological point of view, his first report, in so far as the time is concerned (but not the number), is accurate, though his last statement may refer to another small reform possibly effected during the reign of Firūz.¹

3. The Mazdayasnian tradition, though it ignores the earlier Achaemenian kings before Artaxerxes I (Longimanus), refers many times to the latter monarch (*Ardashīr dirāz-dast*) and his successors as good Zoroastrians. According to the *Bahman Yasht* (ii, 16–17), this king "makes the religion

¹ The scope of this article does not permit the discussion of these reasons here. The place of the epagomenæ indicates that the intercalation was the seventh and eighth together, and not the eighth and ninth. The next or the ninth intercalation would have fallen in A.D. 639, just two years after the fall of the capital of the Iranian empire on the Arab invasion, which brought to an end the national sovereignty of Persia and all its official institutions including the intercalation in their calendar.

current in the whole world".¹ Jackson in his *Zoroastrian Studies* (p. 168) says that "concerning the later Achaemenian rulers everybody is agreed that Artaxerxes I, II, III and Darius Codomannus were true adherents to the faith of the prophet of ancient Iran". Therefore it is certainly reasonable to presume that the adoption and official recognition of the Mazdayasnian calendar was the work of the first Zoroastrian king of Iran.

4. The feast of *Mithra* or *baga*² was, no doubt, one of the most popular if not the greatest of all the festivals in ancient Iran, where it was celebrated with the greatest attention. This was originally a pre-Zoroastrian and old Aryan feast consecrated to the sun god, and its place in the Old-Persian calendar was surely in the month belonging to this deity. This month was called *Bāgayādi* or *Bāgayādish* and almost certainly corresponded to the seventh Babylonian month *Tishrītu*, the patron of which was also *Shamash*, the Babylonian sun god.³ This month was, as has already been stated, probably the first month of the Old-Persian year, and its more or less fixed place was in the early part of the autumn. The feast was in all probability Old-Persian rather than Old- or Young-Avestan, and it was perhaps the survival of an earlier Iranian New Year festival dating from some prehistoric phase of the Aryo-Iranian calendar, when the year began at the autumnal equinox. It was connected with the worship of one of the oldest Aryan deities (*Baga-Mithra*), of whom traces are found as far back as in the fourteenth century B.C. The fact that *Mithra* and similar ancient deities are not mentioned in the *Gāthās*, that they are strangers to the original

¹ *SBE.* v, p. 199, cf. Jackson, *Zoroastrian Studies*, p. 162.

² *baga*, which was originally a general name for gods, seems to have become gradually the name *par excellence* of *Mithra*. The Khwārazmian name for the 16th day of the month is, according to B.'s list, *Figh*, which corresponds to the day of *Mīhr* in the Persian calendar.

³ According to Stuart Jones (*ERE.*, vol. 8, p. 752, on Mithraism), *Mithra* is identified with *Shamash* in a tablet from the library of Assurbanipāl (*R.*, iii, 69, 1, 72).

and pure religion of Zoroaster, that even probably they were considered by this religion as *daēvas* or demons, and that they were admitted into the Mazdayasnian religion only in later times as lesser divinities of the Iranian pantheon,¹ their hymns having been incorporated into the "recent Avesta", might support this thesis. The month *Bāgayādi* was certainly the month in which the feast of *Baga* usually or often fell. It was on the 10th day of this month in the year 522 B.C. that (according to the *Behistūn* inscription, i, 55) the Magian usurper *Gaumāta* was killed by Darius and his associates, and his illegitimate rule was overthrown. According to Herodotus, iii, 79-80 (Rawlinson translation, vol. 2, p. 393), this day was celebrated later each year as the feast of *Magophonia* or the day of slaughter of the Magi, on which day the Magians did not dare to show themselves abroad. He says that "the Persians observe this day with one accord, and keep it more strictly than any other in the whole year. It is then that they hold the great festival, which they call *Magophonia*", and he asserts that "this day is the greatest holy day that all Persians alike keep" (A. D. Godley's translation, vol. ii, pp. 103-4). It is very probable that the day chosen by the conspirators for carrying out their plot against the usurper was the same day as the great national feast of *Baga* worship, when the court was expected to indulge in pleasure and was less on its guard. We may, therefore, conclude that the *Magophonia* of Herodotus (and Ctesias) and the festival of *Baga* worship (or **Bāgayāda* according to Marquart's deduction) was in 522 B.C. on one and the same day, owing to the said coincidence of dates, as Gray is inclined to suppose.² But there is no need to assume that the two words were identical, the former (*Magophonia*) being a misunderstood or misspelt form of the latter (**Bāgayāda*) as Marquart has proposed. As a matter of fact, the tenth day of *Bāgayādi* which corresponded

¹ The *Yasht*, 10, however, makes *Mithra* almost equal in power to *Ahura Mazdā* and the ally of the latter.

² *ERE.*, s.v. *Festival*.

to the tenth or eleventh day of the Babylonian *Tishrītu* was in 522 B.C. on or about autumnal equinox. The tenth day of *Tishrītu* was in that year the 29th of Julian September,¹ whereas the equinox was on the 30th of the same month.² If *Gaumāta* was killed on the eve of the festival, this latter can be supposed then to have been on the 11th of *Bāgayādi*, i.e. exactly on the day of the equinox.³ Therefore it seems to me reasonable to suppose that the great feast of *baga* with which the later (Y.A.) *mithrakana* and the modern *mīhrakān* or *mīhrjān* was certainly identical, was originally the day of the autumnal equinox. This equinox must then necessarily have fallen on the 16th day of the Y.A. month Mihr (the seventh month), at the time of the adoption of that Old-Persian festival in the new Y.A. calendar. This was, as a matter of fact, exactly the case in the years 445–442,⁴ when the first of Farvardīn was on 17th March, or ten days before the vernal equinox, and the autumnal equinox on 28th September.

¹ According to Neugebauer's *Hilfsstafeln zur technischen Chronologie*, Kiel, 1937.

² According to a calculation based on the *Zodiakaltafel* of Schram.

³ We may also suppose that the 10th day of the Old-Persian month corresponded not to the 10th but to the 11th day of the Babylonian month, as a difference of one day is always possible owing, no doubt, to the different time of the first visibility of the new moon in Babylon and Hamadan. The correspondence between this day and the equinox will then be complete. Moreover, according to the narrative of Herodotus (iii, 78) Darius killed *Gaumāta* in darkness, when he was hesitating to strike him lest *Gobryas* should be hit, and Ctesias (*Excerpt. Pers.*, § 14) says that the usurper was sleeping with his Babylonian concubine. Again Herodotus says (iii, 79), that the conspirators after killing *Gaumāta* went out and called the people to massacre the Magians . . . , that the slaughter continued [the whole day], and that if the night had not fallen no Magian would have been left alive. Now from all these facts it can be deduced that the day of the massacre of the Magians or *Magophonia* was, in fact, the day following that of the actual slaying of the usurper.

⁴ If we take into consideration the fact that the Persians of the fifth century B.C. did not obtain in their astronomical calculation the same exact result which we have to-day, the possibility of their error of one day would be easily conceivable. This can account for four years' difference, if the date of the adoption of the calendar was really 441 and not one or two years earlier. Strictly speaking, in 441, the 16th day of Mihr corresponded to 27th September.

It was most probably about this time that the **bagayāda* feast of the Old-Persian calendar was taken into the Y.A. year and was renamed *Mithrakān*. It is very natural to conjecture that this adoption was part of the calendar reform through which the Y.A. calendar replaced the system of the Old-Persian time reckoning. Thus again the Mazdayasnian month containing the feast of *mīthra-baga* was named after that deity *Mithrahe-Mihr* in the Persian calendar, and for the same reason the corresponding Armenian month bore the name of *Mehekān*, the Cappadocian month that of *Mithri* and the Khwārazmian month that of *Omīrē*. The Soghdians, however, kept for this month in their parallel calendar a form of the Old-Persian name, calling their seventh month *βayakānē* (Arabicized *faghakān*).

Now taking the equinox of autumn as the starting point for the division of the year into four equal parts, as according to Epping¹ the Babylonians used to do, and putting it on 16th Mihr in one of the four years between 445 and 441, the conventional solstice day² would fall strictly in the middle of Tīr, which is

¹ It is true that Kugler (*Sternkunde*, vol. i, pp. 173–4, and several other places of this book) contests this assumption and suggests that the starting point for the division of the year into four equal parts (each 91½ days) was the spring equinox. He is of the opinion that since the Babylonian ephemerides always used to put the vernal equinox four to five days later than its real place, the summer solstice (91½ days after that conventional but wrong equinox day) fell a little later than the real solstice and the autumnal equinox (182½ days later) fell incidentally quite in its right and astronomical place. But the result is, nevertheless, the same. It is even possible to suppose that the Babylonians, attaching special importance to the autumnal equinox, tried to keep that point in its strict place, and in order to effect this they placed the day they fixed for the vernal equinox a few days later, so that it would fall exactly two quarters or 182½ days before the astronomical autumnal equinox. This peculiar arrangement, it is true, is noticed only in the cuneiform documents relating to the second century B.C., but there is no reason to think that the same process was not in use in older times.

² With the fusion of the Old-Persian and Young-Avestan calendars into one system about 441 B.C., it is possible that a good many of the characteristics of the Old-Persian calendar, which was in many respects a copy of the Babylonian calendar, were incorporated into the new system. For instance, the adoption of the ordinary four seasons (not as substitutes for their own seasons but as a parallel system) may be one of the effects of

the traditional *maidhyōishama*, but the real solstice would fall on the 14th or 13th day of the month, i.e. on one of the famous *Tīrakān* feasts, the Greater or the Lesser respectively, which may have been connected in origin with this correspondence. The conventional winter solstice would fall on the 16th or 17th day of the month Dai (the real solstice on 15th Dai), perhaps corresponding to the feast of *Gāv-guthīl* (?) = گاوگئیل which was also on the first day of the *gāhānbār* of *maidhyāīrya* and *paitishhahya*, the Avestan time of harvest in Iran, would fall on the 14th September (Julian), i.e. a fortnight before the end of the summer. In 441 the above-mentioned correspondence was in some cases perhaps less strict than in the others, but the difference was in each case only one day.¹

It is a curious fact that many of the feasts connected with, and owing their origin to, the solar seasons and astronomical points of the year, have been transferred to the vague year, being detached from the tropic or fixed solar year, and attached to the civil year. Consequently they have remained in their original places in the latter, free from the effect of intercalation, and have receded against the tropic year about one day each four years. But though they have lost their true and original significance, nevertheless they continued to be celebrated always as marking the points they had originally occupied at the time of the official introduction of the Mazdayasnian calendar.² Besides *Mīhrakān*, *Tīrakān*, and *Gāv-guthīl* (?) we

this fusion. Also the Babylonian way of beginning the spring and summer some days later than the astronomical points (see the note *supra*) may have been followed by the Iranians, and therefore they may have considered the beginning of summer to be conventionally on 15th Tīr, i.e. two days later than the real solstice.

¹ If we put the date of the adoption of the new official calendar in 441 B.C., the summer solstice would fall exactly on 15 Tīr, but *Mīhrakān* would precede the autumnal equinox by one day.

² The same process we find in the *Avardāsāl* feast of Indian Parsis, which is celebrated now on the 6th day (the day of *Khordād* or *Avvrdād*) of the month of Asfandārmadh (the 12th month) and which, no doubt, was created to mark the place of *Naurūz* in the non-intercalated (so-called *Kadīmī*) year after the Parsis had executed an intercalation of one month in the twelfth century (see Kharegat, in *Modi's Memorial Volume*, p. 118).

have in the Persian feast *Sada*, in both *Ādhur-jashn*, in *Ajgār* and two or three other Khwārazmian festivals, as well as perhaps in the Soghdian *Mākhīrajs* and '*Amas khwāreh* (?) = عمس خواره (all described by Bīrūnī), the same phenomena. This means that they are symbolic festivals surviving to mark the original seasonal points of the year, but no longer corresponding to them. Bīrūnī distinguishes these feasts from the true season-festivals by calling them non-religious and the latter religious feasts.¹ In spite of losing their original significance, the former have kept curiously enough some traces of that character.² The *Sada* even literally has preserved the meaning relating to the original place of that festival, for the word means "the hundredth", and it was so named because of its having been originally on the hundredth day of the Zoroastrian winter which is five months, from the beginning of Ābān to the end of Asfandārmadh. This feast was on the first day of the last third of winter, corresponding originally to 20th January (new style)³ which is the first day of the second month of the astronomical winter (Aquarius) and the beginning of the severest part of the cold season in Iran. The Pahlavi commentary of the *Vendīdād* (i, 4) expressly says that the month Bahman (of course, the *vihējākik* month) is the season of the severest cold and that it is the heart of the winter. The above facts prove that the *Sada*, contrary to Bīrūnī's statement (*ĀB*. Istanbul complete manuscript), was not instituted by Ardashīr, but was rather a feast of much older origin.

¹ The same distinction is described in *Dēnkart*, iii, see recent translation by Nyberg in his *Texte zum Mazdayasnischen Kalender*, Uppsala, 1934, pp. 30-39.

² At *Mīhrakān* winter clothes were distributed by the kings, at *Tīrakān* people bathed in the rivers, in the first and second *Ādhur-jashn* they lit fires in their houses, at *Sada* they used to light fires in open places, and the Khwārazmians used the civil feasts as points for the calculation of their agricultural operations even in the tenth century.

³ Or to 15th January, if we take the epagomenæ in calculation and assume it was at the end of Asfandārmadh.

It is also interesting to notice that traces of the historical events connected with **bagayāda* or *Magophonia*, namely the deliverance of Persia from the yoke of a detested usurper (*Gaumāta*) by a popular prince (Darius), are preserved (as Marquart has already remarked) in the Iranian tradition in the form of the legend of the blacksmith Kāveh and the noble prince Frīdūn (*Thraetaona*), delivering Iran from the monstrous usurper Azhi-dahāka on the *Mihrakān* day, as is related by Bīrūnī and others.¹ Similarly in the traditions relating to some of the other famous Iranian festivals, a vague memory of some ancient historical adventures of national importance seems to be preserved. For instance, *Tīrakān* (the 13th day of the month Tīr) is, according to the traditions, the day on which the Iranian nation was delivered from the Tūrānian domination under Afrāsiāb (*Frañrasyān*,² and *Gāv-guthil* (?) or the 16th Dai was the day when Erānshahr was freed from the Turks and Frīdūn returned the cow of Athfiān (*Athwya*) to its legitimate owner after dethroning and imprisoning of Bīvarasf (*Baēvaraspa*).³

It is at the same time also possible, and even probable, that while the feast of *bagā* or the equinox day in the years after 522 B.C. did not, of course, regularly fall on the 10th or 11th day of the Old-Persian month *Bāgayādi*, and oscillated between 16th of the same month and 16th of the Old-Persian month preceding it (Babylonian *Elūl*), nevertheless the 10th (or 11th) day of *Bāgayādi* was still kept as another popular feast and was celebrated regularly in the old Persian luni-solar calendar (presumably from 522 till 441 B.C.), now not as a festival in honour of *bagā* or as the beginning of autumn, but only as the anniversary of the overthrow of Magian rule. Thus both movable and immovable feasts continued to be observed side by side until about 441 B.C.

¹ *AB.*, p. 222. The *Shāhnāmah* of Firdausī, however, puts this event on the first day of Mihr. Had the Y.A. calendar been in use at that time, this day would have fallen in 522, only three or four days after the equinox.

² *AB.*, p. 220.

³ *Ibid.*, p. 226.

when the Y. A. took the place of the Old-Persian calendar (the latter ceasing to exist). On this occasion both feasts were transferred to the Mazdayasnian year, and were fixed on the corresponding days of this year. The *bagā*'s feast (or **Bagayāda*) became the famous *Mihrakān* (the lesser) on the 16th day of Mihr, to which it corresponded in 441, and the *Magophonia* (or as one can say in modern Persian *Maghkushān*), the 11th day of *Bāgayādi*, which at that time (441) corresponded exactly to the 21st day of Mihr (3rd October), became *Rām-rūz*¹ or *Greater Mihrakān*. This explains the tradition which makes *Rām-rūz* the day of the actual capture of Āzhidahāka by Frīdūn, whereas it attributes to *Mihrakān* only the spreading of the first news of the rising of Frīdūn against the tyrannical usurper. The feast of *bagā* used probably to be celebrated for five days, and Herodotus' story of five days continuation of the uproar after the Magi was killed, might be considered as confirmation of this. Since these five days fell incidentally in 441 just on the interval between this feast and *Magophonia*² the two feasts may have been linked together and made into one feast of five days with the first and last days as great festivals. The mention of both feasts by Ctesias³ separately, however, points to a posterior date for this fusion.⁴

5. The date of the second reform of the Y. A. calendar when the New Year's Day was fixed near the vernal equinox, and the practice of the intercalation of one month each 120 years was instituted, is more likely to have been a year on which the beginning of the corresponding Babylonian year (*rēsh-shatti*) or the great feast connected with it (*Zagmūg-Akitū*) fell not far from the same equinox. Out of the years in

¹ In fact, *Rām* is the name of the 21st day of every Zoroastrian month, but the compound word as the name of a feast is only used for 21st of Mihr.

² The equinox was on 28th September and the 10th day of *Bāgayādi* on 3rd October.

³ *Persica*, § 15, and in Athenæus, x, 434 (Charles Burton Gulick's English translation, iv, 469).

⁴ B. attributes this act to the Sasanian king Hormuz (Ormazd IV, 578-590), *AB.*, p. 224.

the first decade of the second half of the fifth century B.C., which are more or less suitable in other respects, only the years 441, 446, and 449 agree with this condition. The Babylonian New Year's Day in 441 was only four days after the equinox day (30th March), in 449 it was three days after that point (29th March), and in 446 it coincided exactly with the first day of spring (26th March). In each of the remaining seven years the interval between the two (*Zagmūg* and the equinox) was much longer. For example in 443 this interval was twenty-six days. Of the three years suitable in this respect, the year 441 possesses other advantages also, as we have seen. Moreover in 441 the Babylonian New Year's Day, if it did not fall on the real equinox, corresponded according to their own computation, to their conventional equinox, which was probably also fixed in the same year on the 30th March.

6. The feast of *Mihrakān* was, in almost all Persian and Arabic literature, always generally considered as the first day of autumn. There are innumerable examples of this, which would take us too far afield to quote here. This is not only the case in the writings of the later part of the eleventh and the earlier part of the twelfth century of the Christian era, when *Mihrakān* had reached again to the first weeks of autumn, but also in much earlier and later periods one meets with the word used in the same meaning. This popular meaning given to the word and the feast is, no doubt, reminiscent of its original place.

7. The *Farvardīgān* feast (Pahlavi *Fravartīgān*) or the feast of manes celebrated in memory of the dead, when according to the Avesta and the Zoroastrian literature the souls of the pious people (*fravashis*) visit their former homes, must have been since the composition of Yasht 13 of the Avesta, at least, identical with the *gāhānbār* of *hamaspathmaēdhaya* near the vernal equinox. The *gāhānbārs*, though probably only one day originally, were from time immemorial celebrated for five days by the Zoroastrians,

the four preceding days being added to the principal feast day, as we find in all Mazdayasnian traditions, but none of them were more than five days. Now if *hamaspathmaēdhaya* and *Farvardīgān* were both originally the same as one of the *gāhānbārs*, as this is implied by the above-mentioned verse of the Avesta, then how is this fact to be reconciled with the assigning of ten days (or strictly ten nights) in the Avesta (Yt. 13, 49) for the "flying of the souls all around their villages" and with the traditional practice of the Zoroastrians, who celebrated the feast of manes (*Fravardīgān*, or perhaps more correctly *Fordīgān*) for ten days not only from the Arab invasion up to the present day, but also in the Sasanian period? ¹ Bīrūnī tells us that a controversy having arisen among the Zoroastrians as to which of the two pentades, the last five days of the month preceding the *Gāthā* days or the latter group itself, was the real *Farvardīgān*, they decided to add both fives together and to make the *Farvardīgān* ten days, and thus this feast became, by compromise, longer than it originally was. He states further that the second five, i.e. the *Gāthā* days or *Andargāh* has superiority over the first. This controversy, if it really took place, could hardly have occurred after the composition of the *Farvardīn Yasht*, which, as stated above, mentions the ten days of the souls' visit.

The question can be solved without much difficulty if we suppose that the final composition of Yasht 13 was posterior to 441 B.C., which supposition, owing to the fact that the reverence of *fravashis* was in all probability a part of the popular beliefs admitted later into the religion, rather than of pure

¹ Menander Protector relates that the Byzantine Ambassador John sent by Justin II in 565 to Persia was obliged when on his way to the Persian court to halt for ten days in the town of Dārā, because of the celebration in Našibīn of the feast of manes, which Menander calls *Furdīgān*, or according to Causin's translation *Furdīga* (*Histoire de Constantinople depuis le règne de l'ancien Justin, jusqu'à la fin de l'empire, traduit sur les originaux Grecs par Mr. Causin, Paris, 1672; les Ambassades . . . écrites par Menandre, Chapitre xii, p. 56*). In that year this feast was certainly on 22nd February-4th March.

Zoroastrianism, seems to be reasonable. We may then assume that the feast of *hamaspathmaēdhaya*, which was in the last days of Asfandārmadh or of the Avestan month corresponding to this perhaps later name, was mainly a rural festival placed towards the end of the winter and immediately before the Avestan "summer," and that it was perhaps connected at the same time with some offering, liturgy, or some sort of religious ceremony (possibly also some remembrance of the dead), but that *Farvardīgān* was the name of the five supplementary days of the year introduced on the model of the Egyptian epagomenæ when the Egyptian system was adopted and the Y.A. calendar replaced the Old-Avestan. Accordingly these epagomenæ called also *Andargāh*, *Gāthā* days, *Panjak veh*, *Dūzūtak*, *Turuftak* and *Panjeh Duzdāda* (Arabic *al-khamsat al-mustariqat*) were originally at the end of the month Ādhur and immediately before the month Dai, i.e. exactly where the Egyptian supplementary days stood. These days were consecrated, as they were in Egypt, to the reverence of the souls of the departed faithful (*fravashis*). Later, when through the second reform (about 441), the epagomenæ were transferred to their well-known place between the end of Asfandārmadh and the beginning of Farvardīn, some doubt may have arisen as to the question of the celebration of one of the two consecutive pentads as the Fravashi's feast. To avoid any negligence in religious duties, the religious authorities may have added both together and made the *Farvardīgān* ten days.¹ The divergence of opinion on this matter, however, did not cease, if one is to judge from the different descriptions

¹ The gradual extension of the religious festivals or mourning days is not a rare thing, and there are many examples of this in Persia in the last centuries. B. says (*Chronology*, Istanbul MS.) that the learned men and kings of Iran have made *Farvardīgān* the greatest of all feasts and have added to it three days more for the manifestation of their devotion, beginning it with the day *Dai-be-dān* (the 23rd). In later ages this feast became still longer and according to Karkaria in *Dastur Hosheng's Memorial Volume* some Parsis have extended it to seventeen or eighteen days, and there was in the last century a good deal of discussion among the Parsis as to the real length of the festival.

given in Pahlavi, Arabic, and Persian books.¹ However, the later sources such as the *Bundahishn* and Bīrūnī's books consider the last five days of the year, i.e. the *gāthā* days, as the *hamaspathmaēdhaya gāhānbār* and also the real *Farvardīgān*, perhaps contrary to their origin but as a natural consequence of the 6th *gāhānbār* coming necessarily immediately before *Farvardīn*.

THE YOUNG-AVESTAN CALENDAR AFTER THE SECOND REFORM

The Zoroastrian vague or civil year continued to be in general use in Persia among the people, from its introduction down to the Islamic period. It was adopted in very ancient times, and perhaps immediately after its official introduction into the Persian empire, by a good many of the neighbouring peoples. In Khwārazm its use goes back probably even to still older times, when the year still began with the month Dai, as the above-mentioned order and length of the Khwārazmian *gāhānbārs* show. The use of the name *Faghakān* for the Soghdian month corresponding to the Persian month Mihr is also a proof of the antiquity of the use of this calendar by that people. The same is true of the Armenians, whose tenth month is called *Marieri*, so named according to Marquart after *maidhyāirya*, certainly at a time when this *gāhānbār* still fell in that month, that is before 321 B.C. Their last month is called *Hrotič* < *Frordīgān* the famous *Farvardīgān* feast which was originally at the end of this month before the said date.² The name of the Persian month Farvardīn may have been adopted later when the feast of the souls stood at the end of this month, i.e. between 321 and

¹ The Pahlavi book, *Mainōg-i Khrad*, which is believed to have been composed about the end of the sixth century, mentions this feast as consisting of five days.

² However, this name indicates the antiquity of the Armenian calendar only if the Armenian *Farvardīgān* did not remain fixed at the end of the vague year, as did the Soghdian.

201 B.C. The name of the fourth month in some of the above-mentioned calendars (e.g. Tir and not Tishtrya), however, may indicate that their model was the Persian copy of the Avestan month, and hence that they were introduced in those countries after 441 B.C. Though the use of Y.A. year declined in Islamic times among the Muhammadan Persians, it did not disappear wholly, and it was still used in some districts in the early years of the present century. The Y.A. calendar to which this year belonged was the official means of time reckoning in the Sasanian period and has continued in use as the religious calendar of the Zoroastrians down to the present day. The only changes which this calendar has undergone are: (1) the removal, in Fārs and some other provinces by order of the Būyid kings (possibly Bahā'ad-dawleh) in A.D. 1106, of the *Andargāh* from the end of the month Ābān, where it stood since the last intercalation, to the end of the year, and (2) the omission of the intercalation after the beginning of the fifth century, (except for one intercalation, but this in the civil year) by a limited community, namely the ancestors of the Indian Parsis, most probably in 1131-2 (or 1126).

THE DOUBLE INTERCALATION

But if on the one hand Bīrūnī's report as to the double intercalation during the reign of Yazdegerd I or of Fīrūz, which involves the repetition of Mihr and Ābān, in one year, was based on an authentic tradition, and if on the other hand the passage of the Pahlavi commentary of the *Vendīdād* (i, 4) relating to the coldest month of winter¹ really means that the *vihējakik* month Bahman corresponded to the month

¹ The passage in question runs as follows: "Those (the two months which are the middle of winter, the heart of winter) now are the months Vahman, and Shahrēvar, that is, the heart of winter, that is it is more severe: although it is all severe, yet at that time it is more severe." I am indebted to Professor H. W. Bailey for the translation of this passage. This may also indicate the age of the said commentary which should have been composed according to the above-mentioned concordance in the fifth century.

Shahrivar of the civil year, the reconciliation of these two facts will not be easy.¹ For, as Paruck has remarked,² the correspondence between the *vihējakik* month Bahman and the civil month Shahrivar implies the correspondence of the *vihējakik* Farvardin with the civil Ābān, whereas the double intercalation involves the assumption that before that operation the civil month Mihr and after it, the civil month Ādhur, corresponded with the *vihējakik* month Farvardin. Therefore the civil Ābān could never have concurred with the latter.

The explanation may be sought in the fact that while the purpose of the intercalation was originally to bring back the 15th day of the *vihējakik* month Tir to the summer solstice (*maidhyōishama*) and the other *gāhānbārs* to their original astronomical places, the popular belief in the equinoctial origin of the New Year, according to Mazdayasnian cosmogony, had gained ground by the fourth century of the Christian era and become generally accepted. Therefore when the seventh cycle of intercalation came to an end in 399, and a new intercalation (the seventh) was due, those responsible for this operation noticed that this intercalation, which ought to have made the first day of the *vihējakik* year (the first day of religious Farvardin) correspond with the first day of Ābān of the civil (*Oshmurtik*) year, would not bring it back to the vernal equinox. They found that this correspondence and consequently the right time for the intercalation (if it was to bring the beginning of the ecclesiastical year to the said equinox) was about A.D. 384. As this time had

¹ Unless one supposes that the occasion was the time for the eighth intercalation, that it was the turn for Ābān to be repeated, that then the eighth and the ninth were effected together by repeating two months (Ābān and Ādhur), but that the epagomenae were moved forward only one month, i.e. to the end of the month Ābān (where they ought to have been placed if there had only been one intercalation) and not to the end of Ādhur, as was to be expected. That such a process has taken place is not, however, easy to assume, though it is not impossible that it has. In that case the institution of the intercalation system must be put about 560 B.C.

² *Journal of the K.R. Cama Oriental Institution*, Bombay, 1937, p. 52.

already passed, and the next occasion, namely about 508, when the first day of Ādhur would correspond to the equinox, had not yet come, they decided to effect a double intercalation of two months, one for the omitted one of the past and the other in anticipation of the next. Adding two months, i.e. a second Mihr and a second Ābān to the (*viḥējakīk*) year they moved the epagomenæ to the end of the civil Ābān, where it has remained. The church, however, apparently still considered for some time the civil Mihr (and not Ābān) as corresponding to the *viḥējakīk* Farvardīn, as this was in fact the real position. After some time, say seventy or eighty years, in the reign of Fīrūz, it may have been decided to consider the epagomenæ the end of the *viḥējakīk* year, and the Mobeds may have resolved to adopt this officially. This decision, or the theoretical adjustment, may be the source of the tradition attributing the last intercalation to the reign of Fīrūz, reported by Bīrūnī in his later book as mentioned above. From a report in the book *Az-zīj-al-Ḥākīmī* or the astronomical tables composed (about the end of the tenth and the beginning of the eleventh century) by the famous astronomer Ibn Yūnis (Paris, *fonds arabe* 2495 fol. 65b–66a), it appears that astronomical observations were undertaken by the Persians some 360 years before the famous observations under the Abbasid Caliph al-Ma'mūn about A.D. 833. This takes the date of the Persian observations back to about 472 and the reign of Fīrūz. This may also have had some connection with the above-mentioned reform or adjustment in that reign.

If, however, both of Bīrūnī's reports as to the last intercalation, according to one of which it took place in the reign of Yazdegerd I, and according to the other in the reign of Fīrūz, should prove to have been based on old and authentic sources, it seems to me this can only be explained by supposing two kinds of fixed year to have been in use. This means that while the stable year, which was most probably a sidereal year, was kept fixed as strictly as possible by some circles (probably

by the Mobeds for religious purposes) it was counted by others (perhaps by the State for financial matters) roughly as $365\frac{1}{4}$ days, like the Julian year of the Romans. Consequently an intercalation of one month each 120 vague years was necessary to keep this last kind of year fixed, whereas to stabilize the first one (held to be about 365 d. 6 h. 13 m.) the intercalation of one month each 116 (or 115) years would have sufficed. Starting from the year 441 B.C. the seventh 120th yearly intercalation (which was at the same time a double one) ought to have taken place, as stated above, in A.D. 399, i.e. the beginning of the reign of Yazdegerd, but the seventh 116th (or sometimes 115th) yearly intercalation would have been executed about thirty years earlier, and the eighth one would have been effected about A.D. 485, i.e. towards the end of the reign of Fīrūz.

The existence of different estimates for the length of the solar year in Persia may be inferred from the different statements of the *Bundahishn* on this point. This book gives the said length in chapter 5 (Nyberg, *Pahlavi Texte* . . . , p. 29) as 365 d. 5 h. and some minutes (or a fraction of the hour).¹ In chapter 25, however, the same book contains the statement that the length of the year or "the revolution of the sun from Aries to the end of the months" was 365 d. 6 h. and some minutes. This last estimation is also given in the *Dēnkart* (ibid., pp. 19 and 31). According to Bīrūnī (*ĀB.*, p. 119) the length of the year was considered by the Persians to be 365 d. 6 h. 13 m. and according to Abū Ma'shar of Balkh (ninth century) quoted by Sajzī (Brit. Mus. MS. Or. 1316, fol. 79) the fraction was held by them to be 6 h. 12 m. 57 s. 36 th. The same is given by Kharaqī (twelfth century) in his book *Muntahā al-idrāk* . . . (Berlin MS.).²

¹ This fraction of day might have been made in practice a round number of hours, i.e. six hours or a quarter of a day.

² Both Abū Ma'shar and Kharaqī give the number in the terms of an arc of the celestial sphere, which converted into time would make the number mentioned above.

It was according to Ḥamza of Isfahān (tenth century) 6 h. 12 m. 9 s. (*ĀB.*, p. 52) and according to 'Abd ar-raḥmān al-Khāzin (twelfth century) in his *Az-zīj al-mu'tabar as-Sanjārī* (Vatican MS. fol. 21) only 6 h. 12 m. This fraction which agrees nearly with the fraction of the sidereal year as calculated by the Babylonians, namely 6 h. 13 m. 43 s. would need the intercalation of one month each 116 years and sometimes 115 years (if the fraction should be taken as 6 h. 13 m.). As a matter of fact, this kind of intercalation (116-yearly) was practised in ancient Iran according to *Kitāb al-awā'il* of 'Askarī quoted by Ṣafadī in his *al-wāfi bil-wafayāt* (*JA.* 10^{ième} série, tome xvii, 1911, p. 278). The same process is reported also by the author of the *Ta'riḫ-i Qum* (of which the Arabic original was composed about 984), by al-Kharaqī, and by al-Khāzin in their above-mentioned books, and by Bīrūnī (*ĀB.*, p. 11).

The suggested existence of two fixed years, however improbable it may be, would explain not only the two different dates of the last intercalation, but also the two different periods of 120 and 116 years for the operation given in the above-mentioned sources: The tradition regarding the stabilization of the year by the government by means of intercalation for keeping a fixed time for "opening the tax collection" may also confirm the existence of a fixed year in the affairs of the State.

Note.—The theory proposed above, of the two reforms of the calendar necessarily involves the assumption that on the occasion of the second reform the epagomenæ, though they were put at the end of the month Asfandārmadh, were not removed in the same year from the end of the month Ādhur where they had stood up to that time. This means that in that year both months had at their end five supplementary days. It is not incredible to attribute such accuracy, which was also necessary for keeping the strict correspondence existing at that time between the Persian and the Egyptian

months and days, to the king's astronomers in Babylon, though the above point was neglected on the occasion of the first intercalation (due in 321 B.C.).

* * * * *

CONCLUSION

The history and development of the Iranian calendar may be recapitulated according to the theory laid down in this article as follows :—

An original Aryan or the earliest Iranian calendar, belonging to the period when that race was possibly inhabiting the most northerly steppes between the Oxus and the Jaxartes, a land of severe cold, may be inferred from the Avestan verse (*Vendidad*, i, 2-3) which makes the year consist of a winter of ten months and a summer of two (still rather cold) months. At a later period, probably under the influence of a milder climate in the regions occupied by the same people in their southward movement, the adoption of a new division of the year, into two equal parts from one solstice to the other, similar to the Vedic *ayanas*, can be deduced from the two old season festivals, marking the beginning and the middle of the year, and the first of them meaning mid-summer. Still later, owing to the change of climate, experienced as a result of the said movement, the summer was made still longer by adding to it the last fifteen days of the astronomical winter as well as the first fortnight of autumn at the beginning and end respectively. Gradually further divisions of the year were introduced until five seasons were instituted.¹ Thus the summer of seven months ran from *hamaspathmaēdhaya* to *ayāthrima*, and the winter of five months from the latter to the former *gāhānbār*. This calendar we have called Old-Avestan.

¹ *maidhyōizaremaya*, as stated above, was in all probability the last to be introduced.

Another calendar of the Babylonian type has also been in use from ancient times among the south-western section of the Iranian race, who, coming in contact with, and under the influence of Elamite and Assyro-Babylonian culture, had apparently adopted some of its institutions. Their year was a luni-solar one, almost exactly corresponding to the Babylonian in every respect, except perhaps in the beginning of the year, which was probably around the autumnal equinox instead of the vernal. This practice of beginning the year with autumn was either brought by this south-western people from their original home, the cradle of the Iranian race, where it may have been in use among some of the oldest representatives of that race or in a certain period of their history, as Marquart is inclined to suppose, or it was introduced in imitation of the system of time-reckoning of some south-western people (Elamites or some of the Sumero-Babylonian cities) whose year also may have begun with autumn.

The Zoroastrian religion which had appeared among the eastern Iranians, whom we may conveniently call the *Avestan people*, probably in the earlier part of the sixth century B.C.,¹ gradually spread among other Iranian peoples also, and may have had a considerable number of followers in *Pārsa* as well as in the other provinces of Iran. The Old-Avestan calendar became the religious calendar of the followers of Zoroaster everywhere, including the communities in the south and west. With the opening of direct relations between Iran and Egypt after the conquest of the latter country by Cambyses, and particularly after the establishment by Darius of friendship between the two nations, the Zoroastrian community probably changed their somewhat complicated Old-Avestan calendar for the much simpler Egyptian year, which had only a round number of days without fraction,

¹ I follow the Zoroastrian tradition which puts the coming of the religion 258 years before Alexander's conquest of Persia, though I am aware of the controversy concerning this question.

and was not subject to any intercalation. This change must have taken place in the later part of the sixth century B.C. The strict copying of the Egyptian calendar, except in the month names and religious festivals, involved the fixing of the beginning of the year in the month Dai, which was at that time about the winter solstice. The year, now becoming vague began to move backward in the tropical year, and consequently the places of religious season festivals (*gāhānbārs*) were changing in each year. This instability, which was certainly noticed after some years, say half a century, became striking, and was further very inconvenient for the Mobeds. The priests then found it necessary to prevent this variation in the positions of the holidays by inventing a fixed year for religious purposes and especially for keeping the *gāhānbārs* in their seasonal places. This sort of year, called *vihejakik*, which was in actual use in religious circles and was by no means a wholly fictitious year, as some seem to believe, was created through the institution of an intercalation of one full month in each cycle of 120 (or 116) years. It is reasonable to assume that this reform, together with the alteration in the date of the beginning of the year from the Egyptian New Year's Day to approximately the Babylonian new year, (i.e. around the vernal equinox), may have taken place simultaneously with the conversion of the Achæmenian kings to the Zoroastrian faith. The traditional places of the *gāhānbār* in the year which are, no doubt, the positions these festivals held at the time of their stabilization, point to the date of this reform being about 441 B.C.¹

¹ It is, however, also possible, though not very probable, that this process of two successive reforms was in reverse order, i.e. that first the State and the Achæmenian court adopted the Egyptian system in place of their Old-Persian calendar and that subsequently the Zoroastrian community also adhered to it.

1977

3- Agathodaimon an American name

5- Ērān (little phonetically run down)

Land of (an) Ēr (q. Egypt.)
 (ER-ur) etz.
 q. Elte an

12-13 } from adapts Egyptian - Babylonian Calendar
 17 }
 15 - Tichtray = Sirius = rain

18 bot. : 5848 B.C. early date for Egypt,
 & old Sumerian calendar

(as 245848 = 11696 B.C. Atlantis link)

19- the Sumerian Apra-aka first Andra - Sirius - Huruz

19-3 decades of Drought (anti-winter (Apra)) 19/100
 each month

20m - Tichtray, Apra, Mithra
 with Zoroastrian (Persian old Babylonian)

30m - O. Persian calendar in 24 15-day units
 (16+8) 15 = 360

38- Mithra = haze (dirty poor excellence)

39- Magians measured by the Zoroastrian
 19 Sept. 522 B.C. During

and he saw the great point of Mithra, the
 bright Magian holy day
 Later celebrated by Magians as anniversary of
 Magian rule

504 Far { a Persian province (q. Parsi = Farsi)
 563 Pagan
 55- Old Persian in old mts.